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A manual containing the

courses of study for the High schools of W.

# A MANUAL

## Containing Courses of Study

## For the High Schools of

## West Virginia

PREPARED BY THE STATE BOARD OF EDUCATION
AND ISSUED BY THE

DEPARTMENT OF FREE SCHOOLS

M. P. SHAWKEY, STATE SUPERINTENDENT.

1912

# A MANUAL

CONTAINING

# THE COURSES OF STUDY

—FOR THE—

# HIGH SCHOOLS

—OF—

# WEST VIRGINIA

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PREPARED BY THE

STATE BOARD OF EDUCATION

AND ISSUED BY THE

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M. P. SHAWKEY, *State Superintendent.*

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Issued 1909

Revised 1912.

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## INTRODUCTION.

An act of the Legislature of 1908 creating a State Board of Education provides that the Board shall constitute a committee on program of studies, and shall prescribe a program of studies for the public schools of the State including the primary, graded, intermediate, and high schools. In compliance with the act referred to above the State Board of Education has prepared the first official program of studies for the high schools of West Virginia. The present program is a revision of the former.

M. P. SHAWKEY, Chairman.
J. D. GARRISON, Secretary.
J. N. DEAHL.
H. B. WORK.
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# PROGRAMS OF STUDIES

## THE AIM OF THE HIGH SCHOOL.

The purpose of a high school is to afford to boys and girls an opportunity to prepare themselves more fully for life than the elementary school will permit. The three or four years immediately following the elementary school period have been found to be unsuccessful for those who leave school to enter upon life duties. There is a waste of energy and time that neither the state nor society can afford. The remedy is to keep the pupils in a proper school. This period of youth is also the one in which character is formed. It is even of more importance for the boys and girls to be in school during adolescence than in the elementary school of childhood. The problem is to furnish the right kind of school. The organization and proper aim of studies in the high school must make it possible for a larger number of boys and girls to pursue its course with profit to themselves. To this end the school must impart knowledge to secure efficiency, develop interest to secure motive and effort, encourage and instill culture to secure balance and poise of mind.

The problem of the high school is to find subjects for study that pupils can pursue with profit. The subjects of study must be suited or adapted to the capacity of the pupil or no knowledge or interest or culture will be acquired. The value of the study depends upon its adaption to the pupil. The knowledge of most value to the pupil is that which he can most thoroughly acquire; the interest that enriches life most is furnished in largest measure by the school subjects that the pupil can best comprehend and understand; the culture that refines and ennobles life most is obtained in the pursuit of those subjects in which the pupil can get the clearest insight of the world in which he lives. The cultured person of the twentieth century is the one who can meet the situations in life, the problems of our present civilization, with keen discrimination, large tolerance, and effective service.

## ADMISSION REQUIREMENTS.

The requirements for admission to the high school should be flexible that no one may be deprived of educational opportunity. The minimum requirements should be that the pupil is prepared or able to pursue some one or more of the subjects in the high school with profit to himself. The maximum should be the successful completion of an elementary school program of studies or its equivalent.

## REQUIREMENTS FOR GRADUATION.

There should be both a minimum and a maximum standard for graduation from a high school. The diploma should be awarded for the completion of eight, twelve, or sixteen units in the program of studies, in a two year, three year, or four year high school respectively, at four different grades, as follows:

(1) A diploma awarded on a general average of 65%, minimum grade 60%.

(2) A diploma with credit awarded on a general average of 75%, minimum grade 70%.

(3) A diploma with honor awarded on a general average of 80%, minimum grade 75%.

(4) A diploma with highest honor awarded on a general average of 90%, minimum grade 80%.

## STANDARD HIGH SCHOOLS.

A standard high school is one offering a number of units of which fifteen are required for graduation. There should be not fewer than four teachers, and the teaching, the teaching corps, and the equipment of the school should meet the regulations indicated below. Four years of thirty-six weeks are required for the average pupil to complete the fifteen units; the exceptionally bright pupil may complete in three years, while the slow pupil may take five. In schools where physical training and chorus singing are offered, it is probably well to require as many as sixteen units for graduation; these subjects should be given credit.

There are many advantages in having the high school year to consist of thirty-six weeks, even if the grades do not continue for the same length of time. However, a high school can organize its work for a twenty-four week or thirty-six week year so that its pupils may finish a two year program of thirty-six weeks in three

years or less; a three year program may be finished in about four years or less; a four year program in six years or less time.

The character of the work done in a small high school in which the teaching force is not large may be improved by alternating some of the subjects. For example, if but one unit of mathematics or one unit of biology, or botany, or physics, etc., is offered it may be given every other year. A plan of this kind may be provided for in organizing the program of studies and the daily schedule of recitations. This will enable teachers to keep the number of their daily recitations within the limit of five or six per day and thereby do better teaching.

## HIGH SCHOOL REGULATIONS.

1. All programs of studies should be on the unit basis of eighteen or thirty-six week courses.
2. No changes in the organization of courses should be made, that would operate unfavorably to pupils already in high schools.
3. No teacher should conduct more than five, at most six, recitations per day. The recitation periods should be at least forty minutes in length.
4. High school teachers should be graduates of standard colleges or their equivalent and have adequate professional education.
5. The equipment of high schools should be such in libraries, laboratories, etc., as required by the supervisor of high schools.
6. No subject should be offered for less than one half year.
7. Algebra and Geometry should not be offered for more than one and one-half years each.
8. No science should be offered for less than one full year.
9. No foreign language should be offered for less than two full years and no diploma credit should be given for less than one year.
10. In offering history in the high school preference should be given in the following order: American History, English History, Mediaeval History, Ancient History.
11. English should be studied during the entire period of four, three, two years, respectively, with at least four recitation periods per week.

## PRESCRIBED UNITS.

A unit represents the work done in a subject in a high school in

thirty-six weeks of five recitations per week, with recitations of at least forty minutes in length; half a unit would represent eighteen weeks' work. The amount of work necessary to secure a unit credit for graduation will be indicated in the detailed statement of subjects.

Not fewer than five units nor more than ten of the fifteen necessary for graduation from a four year high school may be prescribed. These may be selected from the following groups of subjects:

Minimum number of prescribed units (5).

English.....3 units.
Science, or Industrial Subjects.....1 unit.
History, (American History and Civics, and English History.).....1 unit.

Maximum number of prescribed units (10).

English.....4 units.
Mathematics, (Algebra 1, Geometry 1.) ...2 units.
Science, or Industrial Subjects.....2 units.
History, (American History and Civics, and English History.).....2 units.

### ELECTIVE UNITS.

The remaining five or more units necessary for graduation may be selected from the following groups of subjects:

Mathematics.....1 more unit.
Foreign Languages, (Latin 3, German 2, French 3.).....2 or 3 more units.
Science.....2 more units.
History.....2 more units.
Industrial Subjects.....3 more units.
Art, (Music, Drawing).....2 units.

### REQUIREMENTS FOR THREE YEAR HIGH SCHOOLS.

There shall be not more than seven units of the eleven necessary for graduation prescribed. These may be selected from the following groups of subjects:

English.....3 units.
Mathematics.....1 unit.
History.....2 units.
Science.....2 units.
Industrial Subjects.....2 units.

The remaining four electives may be chosen from the following subjects:

Mathematics.....2 more units.
Industrial Subjects.....2 more units.
Latin or German, or French.....3 units.
History.....1 more unit.
Science.....1 more unit.
Art.....2 units.

## REQUIREMENTS FOR TWO YEAR HIGH SCHOOLS.

There shall be not more than five units prescribed to be selected from the following:

English.....2 units.
Mathematics.....1 unit.
History.....1 "
Science.....1 "
Industrial Subjects.....1 "

The electives may be chosen from the following subjects:

Mathematics.....1 more unit.
Latin or German, or French.....2 units.
Science.....1 more unit.
Industrial Subjects.....1 " "
History.....1 " "
Art.....1 unit.

## TYPE PROGRAMS

### FOUR YEAR PROGRAM.

#### First Year.

| First Semester. | Second Semester. |
|---|---|
| English 4 | English 4. |
| Algebra 5 | Algebra 5. |
| Biology 5 (Elementary Botany, Zoology and Physiology) | Biology 5 (Elementary Botany, Zoology and Physiology) |
| History 5 | History 5. |
| Latin or German or French 5 | Latin or German or French 5 |
| Commercial Arithmetic 4 | Commercial Geography 4 |
| Typewriting 1 | Typewriting 1 |
| Drawing 1 | Drawing 1 |
| Music 1 | Music 1 |

#### Second Year.

| | |
|---|---|
| English 4 | English 4 |
| Geometry 5 | Geometry 5 |
| Botany 5 | Botany 5 |
| History 5 | History 5 |
| Physiography 5 (Physical Geography and Elementary Geology) | Physiography 5 (Physical Geography and Elementary Geology) |
| Latin or German or French 5 | Latin or German or French 5 |
| Bookkeeping 4 | Bookkeeping 4 |
| Industrial History 1 | Industrial History 1 |
| Drawing 1 | Drawing 1 |
| Music 1 | Music 1 |

#### Third Year.

| | |
|---|---|
| English 4 | English 4 |
| Algebra 5 | Geometry 5 |
| Chemistry 5 | Chemistry 5 |
| History 5 | History 5 |
| Latin or German or French 5 | Latin or German or French 5 |
| Designing 3 | Designing 3 |
| Stenography 4 | Stenography 4 |
| Typewriting 1 | Typewriting 1 |
| Drawing 1 | Drawing 1 |
| Music 1 | Music 1 |

**Fourth Year.**

English 4
Physics 5
Agriculture 5
American History and Civics 5
Domestic Science and Art 5
Latin or German or French 5
Mechanical Drawing 3 / Manual Training 4
Commercial Law 4
Zoology 4
Drawing 1
Music 1

English 4
Physics 5
Agriculture 5
American History and Civics 5
Domestic Science and Art 5
Latin or German or French 5
Mechanical Drawing 3 / Manual Training 4
Business Corresponding and Stenography 4
Zoology 4
Drawing 1
Music 1

## THREE YEAR PROGRAM.

**First Year.**

First Semester.
English 5
Algebra 5
Biology 5
History 5
Latin or German or French 5
Commercial Arithmetic 4
Typewriting 1
Drawing 1
Music 1

Second Semester.
Algebra 5
English 5
Biology 5
History 5
Latin or German or French 5
Commercial Geography 4
Typewriting 1
Drawing 1
Music 1

**Second Year.**

English 5
Geometry 5
Physiography 5
History 5
Chemistry 5
Latin or German or French 5
Industrial History 1
Bookkeeping 4
Drawing 1
Music 1

English 5
Geometry 5
Physiography 5
History 5
Chemistry 5
Latin or German or French 5
Industrial History 1
Bookkeeping 4
Drawing 1
Music 1

**Third Year.**

English 5
Algebra 5
Physics 5
History 5
Agriculture 5
Domestic Science and Art 5
Latin or German or French 5
Stenography 4
Typewriting 1
Drawing 1
Music 1

English 5
Algebra 5
Physics 5
History 5
Agriculture 5
Domestic Science and Art 5
Latin or German or French 5
Stenography 4
Typewriting 1
Drawing 1
Music 1

**TWO YEAR PROGRAM.**

**First Year.**

First Semester.
English 5
Algebra 5
Biology 5
History 5
Latin or German or French 5
Commercial Arithmetic 4
Typewriting 1
Drawing 1
Music 1

Second Semester.
English 5
Algebra 5
Biology 5
History 5
Latin or German or French 5
Commercial Geography 4
Typewriting 1
Drawing 1
Music 1

**Second Year.**

English 5
Geometry 5
Physiography 5
Agriculture 5
History 5
Latin or German or French 5
Bookkeeping 3
Stenography 2
Drawing 1
Music 1

English 5
Geometry 5
Physiography 5
Agriculture 5
History 5
Latin or German or French 5
Bookkeeping 3
Stenography 2
Drawing 1
Music 1

# COURSE OF STUDY

## ENGLISH.

The elements of a course of study in English are grammar, literature, and composition and rhetoric.

### First Year.

*Grammar.*—Most pupils enter high school without an adequate knowledge of English grammar. The time may come when pupils who enter will be so well grounded in grammar that the study of literature may be begun at once; such at present is not true. An accurate knowledge of grammatical construction and grammatical analysis is indispensable to the right interpretation of literature and to correct expression of thought. This grammatical knowledge should be given as far as possible through easy selections of literature; however, it is well to have some good text-book on grammar which may be used for class and reference work.

*Literature.*—The literature selected for this year's work should be within easy range of the pupil's comprehension so that his interest will be aroused and a lasting love for literature created. Along with the selections required for reading and study in class there should be a certain amount of collateral reading. The books for collateral reading should be few, carefully selected by the teacher, and within the grasp of the pupil's knowledge.

*Composition.*—A theme should be required once a week or once in two weeks. This may be read in class by the pupil, or the teacher may read it, using it as a basis for much of the necessary drill in grammar. In short, the time during the first year may be allotted as follows: grammar two periods per week, literature two periods per week, composition one period per week. The following selections are suggested for study and reading in the first year. The teacher may choose according to the ability of the class.

*For Study.*

Snow Bound—Whittier.
Silas Marner—Eliot.
The Courtship of Miles Standish—Longfellow.

Elegy in a Country Churchyard—Gray.
First Bunker Hill Oration—Webster.
Julius Caesar—Shakespeare.
Christmas Carol—Dickens.

*For Reading.*

Man Without a Country—Hale.
Oliver Twist—Dickens.
Ivanhoe—Scott.
Treasure Island—Stevenson.
Tanglewood Tales—Hawthorne.
Being a Boy—Warner.
Cranford—Gaskell.
Tales of a Wayside Inn—Longfellow.
Vicar of Wakefield—Goldsmith.

**Second Year.**

It is taken for granted that the technical parts of grammar have been sufficiently emphasized in the grades and in the first year in high school so that the second and third years of high school may be devoted largely to literature, together with incidental themes as are suggested by the selections which are read and studied.

*Literature.*—The aim of the second year's work should be to arouse a greater interest in good books, and to develop a taste for extensive reading. This may be best done by placing the emphasis upon American authors. It is not intended that a formal course in the history of either English or American literature be given in any high school year, but a good general knowledge of both may be given in connection with the literature in the second and third years. The approach to each should be through selections of literature. Select a few of the best writings from some author, make careful study of these, and develop a desire in the pupils to know something about the life of the writer. The biography of the writer may then be profitably studied with reference to the period covered in the history of literature. In this way the pupil will have gained a knowledge of the best selections in literature, and also a working knowledge of its history. In addition to the selections studied a number of selections and some books should be read outside of class.

*Composition.*—Frequent themes based upon the pupil's reading and experience should be required. No formal text book in

rhetoric need be used in this year. The writing should consist of narrations, descriptions, expositions, and informal argumentations. The pupil should be encouraged to express himself freely and vigorously, to think accurately and above all to get the result of his thinking expressed on paper. Serious grammatical and rhetorical errors should be pointed out, but nothing should be done which will hinder freedom of expression.

*For Study.*

Vision of Sir Launfal—Lowell.
Gettysburg Address—Lincoln.
Sketch Book—Irving—(Selections.)
Thanatopsis—Bryant.
Birds and Bees—Burroughs.
Poems of Nature—Whittier.
Tales—Poe.
As You Like It—Shakespeare.
Essay on Nature—Emerson.
Essay on Self Reliance—Emerson.
Selected Essays—Lowell.

*For Reading.*

The Pathfinder—Cooper.
The Last of the Mohicans—Cooper.
Luck of Roaring Camp—Harte.
Autocrat of the Breakfast Table—Holmes.
Poems—Lanier.
Oregon Trail—Parkman.
House of Seven Gables—Hawthorne.
Innocents Abroad—Twain.
Huckleberry Finn—Twain.
Reply to Hayne—Webster.
The Other Wise Man—Van Dyke.
Story of a Bad Boy—Aldrich.

**Third Year.**

The subject-matter for the third year should consist principally of a study of English literature and English authors. The method should be practically the same as the second year; however, the work may be made more intensive.

*Literature.*—Choice selections should be made from English writers and pursued the same as indicated in the second year's work. A text-book on the history of English literature may be used, but should be more for reference than for study. A book of good selections is better in the hands of the pupils than a history of literature. Each pupil should read from ten to fifteen standard books.

*Composition.*—The themes should be more carefully criticised than in the second year, but freedom of expression should still be the aim. In both second and third years it is well to spend an amount of time equivalent to three periods per week on literature and not more than two periods on composition.

*For Study.*

Sir Roger de Coverley Papers—Addison.

Idylls of the King—Tennyson. (Gareth and Lynette, Lancelot and Elaine, Passing of Arthur.)

Lady of the Lake—Scott.

Quentin Durward—Scott.

Henry Esmond—Thackeray.

Romola—Eliot.

Macbeth—Shakespeare.

Ancient Mariner—Coleridge.

Lycidas—Milton.

Golden Treasury—book 4—Palgrave.

*For Reading.*

The Lost Leader—Browning.

How They Brought the Good News from Ghent to Aix—Browning.

Herve Riel—Browning.

Twelfth Night—Shakespeare.

Alexander's Feast—Dryden.

David Copperfield—Dickens.

Tale of Two Cities—Dickens.

Essay on Man—Pope.

Prisoner of Chillon—Byron.

The Virginians—Thackeray.

The Mill on the Floss—Eliot.

Les Miserables—Hugo.

Deserted Village—Goldsmith.

**Fourth Year.**

The fourth year's work should consist largely of a careful study of rhetoric and composition. If the study of literature has been carefully carried out as suggested in the second and third years with adequate attention to elementary composition, the pupils have now a good foundation for the study of formal rhetoric and composition.

*Rhetoric and Composition.*—A few well selected books should be read this year but the emphasis should be placed upon writing and a study of model essays. It is desirable to require three or four themes per week for at least the first semester. Narration, description, exposition and argumentation should each in turn receive special attention. Paragraph structure with respect to unity, coherence, emphasis, the use of the topic sentence, connectives, transitions; the sentence, long and sort, loose, periodic, and balanced, and other rhetorical points should be discussed, studied and criticised in the themes, both in class and in private conferences. Examples of each of the four kinds of writing should be read by the teacher in class.

The latter half of the year should be spent upon a study of the essay as illustrated by selections chosen from Hazlitt, Macaulay, Carlyle, DeQuincey, Lamb, Stevenson and Kipling. Many pupils will not go to college, hence in the fourth year they should be carefully drilled in practical composition, and should be given a lasting taste for the best specimens of modern literature.

*For Study.*

Selected Essays—Hazlitt.
Essays of Elia—Lamb.
Joan of Arc, English Mail Coach—DeQuincey.
Essay on Burns, or Heroes and Hero Worship—Carlyle.
Life of Johnson or Lord Clive—Macaulay.
Sesame and Lilies—Ruskin.
To be Selected—Stevenson.
To be Selected—Kipling.
Essays—Bacon.
Speech on Conciliation—Burke.

*For Reading.*

At the beginning of the fourth year an inventory of what the

pupil has read should be taken. If he has missed anything which is considered essential he should read it. If he is going to college it might be well for him to read the supplementary lists to the college entrance requirements in English. If on the other hand he is going to enter the industrial world let him read some of the best literature in the field of his chosen profession.

## MATHEMATICS.

Three years are given to this subject. The first year to algebra; the second to plane geometry; the first half of the third year to algebra, and the second half to solid geometry.

The work should be made to touch as much as possible the actual life and experience of the student, so that it may not become mere form.

A few definitions and questions are regarded as essential, and drill in these is constant, until the pupil becomes so familiar with them, as to make them a part of his general fund of knowledge.

### First Year—Algebra.

In the first half of the year the following ground is covered: (a) definition and notation; (b) drill in language of algebra (c) fundamental operations; (d) simple equations, not involving algebraic fractions, with ample applications to the problems involving them; (e) factoring; (f) fractions, including complex fractions, and ratio and proportion; (g) linear equations, both numerical and literal, containing one or more unknown quantities; (h) problems depending on linear equations; (i) radical, including the square root of polynomials and of numbers,—exponents, including the fractional and negative exponents.

Definitions and notation are introduced whenever needed, and teachers must observe that these are placed in text-books on algebra in separate chapters merely to present an orderly arrangement, and not to indicate the sequence of lessons.

The pupil is led to realize the need of general terms by referring to his own experience. His attention is called to the fact that just as integers in arithmetic are not sufficient for all the emergencies of experience, and fractions are introduced, so here positive numbers are not sufficient, and negative numbers must be introduced.

The transition from arithmetic to algebra is gradual. Statements of arithmetical conditions are repeatedly made until the truth of the general or algebraic statement is readily appreciated.

### Second Year—Plane Geometry.

The ground is covered as taught in a standard text-book. We do not insist upon too much work in definitions at first, but let the definition grow into the mind with the growth and development of the subject. The pupil, however, does not leave the subject without exact and definite ideas of such geometrical concepts as admit of formal definition, and the memorization of the definitions in the very words of the book is the best means to this end. Some slight original work is given from the first, increasing throughout the year. The student is encouraged in making applications of geometrical principles outside of the class.

### First Half Third Year—Algebra.

The work of the third year consists of algebra, one-half year, and of solid geometry, one-half year. Algebra is given in the first half-year and solid geometry in the second. In algebra the work includes: (a) quadratic equations, both numerical and literal; (b) simple cases of equations with one or more unknown quantities that can be solved by the methods of linear or quadratic equations; (c) problems depending on quadratic equations; (d) the binomial theorem for positive integral exponents; (e) the formulas for the nth term and the sum of the terms of arithmetical and geometrical progression, with application.

The pupils are required throughout the course to solve numerous problems which involve putting questions into equations. Some of these problems are chosen from mensuration, from physics, and from commercial life. The use of graphical methods and illustrations, particularly in connection with the solution of equations, is also emphasized.

### Second Half Third Year—Solid Geometry.

The work covers the amount given in the standard texts. The aim is to make the work thorough, definite and accurate.

## LANGUAGES.

### LATIN.

### First Year.

A first book in Latin, completed. For the latter part of the

year a text in easy Latin should be used. Throughout the entire year special attention should be given to the following:

(1) Accurate pronunciation.
(2) The inflections.
(3) Acquiring a vocabulary.
(4) Elementary principles of syntax.
(5) The simple rules for composition.
(6) Derivation of words.
(7) The subjunctive.
(8) Relative and conditional sentences.
(9) Indirect discourse.

**Second Year.**

Caesar's Gallic War, any four books, preferably the first four. Systematic work in connected prose composition. Frequent review of the work done in the first year.

**Third Year.**

Cicero's orations. Any six from the following list: The four orations against Catiline, the Archias, the Manilian Law, Marcellus, Ligarius, Roscius, Milo. Systematic work in connected prose composition and Latin Grammar.

**Fourth Year.**

Virgil's Aeneid I-VI. Systematic work should be given in mythology and scansion and the work in grammar and composition in the second and third years should be carried on throughout the year.

The following books should be in every high school library:

Froude's Caesar.
Trollope's Cicero.
Sellar's Virgil.
Gayley's Classic Myths.

**GERMAN.**

**First Year.**

Note:—It will be observed that this program of studies allows schools to provide for a course of three years in this language, and that diploma credit should not be given for courses of less than two years. In schools offering a two years course the work should be identical with the work as given for the first two years of the three year course.

The first year's work in grammar should extend about to syntax. The course should include the following lines of work and be arranged something as follows:

1. Very careful and thorough drill in pronunciation extending throughout the year. Study of the fundamental differences between German and English methods of utterance.

2. Thorough and systematic drill in the inflections of articles; pronouns; strong, weak and mixed nouns; of the strong, weak and mixed verbs, the auxiliaries, modals, etc.; study of the more general rules of gender, the classification of nouns, the formation of the passive voice, the main principles of mode and tense; the various sentence orders. The use of German script should be taught, although it is not necessarily much used.

3. Abundant exercises designed to illustrate the above forms and principles and fix them in memory.

4. Memorizing and frequent repetition of easy colloquial and idiomatic sentences. This is especially important and valuable in giving the student confidence in the use of language and the *feeling* of it.

5. Reading of from 100 to 150 pages of graduated texts.

6. Constant practice in translating into German appropriate sentences based upon all of the work referred to above.

**Second Year.**

The work in the second year should include the following:

1. A thorough review of the grammatical principles learned during the first year.

2. The reading of 150 to 200 pages of literature in the form of easy stories, plays, etc., somewhat more difficult in style than those of the first year.

3. Regular work, once a week or oftener, in some text book in German composition.

4. Occasional practice in sight reading.

5. Continuation of work in memorization of idioms, conversational expressions, proverbs and sayings, short poems, etc.

**Third Year.**

Much of the work of this year should consist of reviewing and applying the work of the previous two years. The correlation and co-ordination of the more or less isolated and fragmentary knowl-

edge of the student is especially important here, and some comparisons with English grammar may well be made. The object to be reached by the student at the close of this year is a proficiency indicated about as follows: the ability to read at sight German prose and poetry of moderate difficulty; the ability to put into correct German easy English passages; to explain questions relating to ordinary grammatical forms; and to translate and explain, with previous study, the more difficult passages ordinarily occurring in German literature.

Texts read and studied should be such as to give the student a sympathetic knowledge of German life, thought, traditions, and ideals.

### FRENCH.

A two year course only is presented in French. It should be given in general largely as indicated in the first two year's work in German. The French accent and pronunciation should be given careful attention, to which end the instructor should pronounce well, and thoroughly understand the formation of the sounds of the language. Thus the pupil may learn both by imitation and by careful instruction in the correct methods of articulation, vocalization, etc.

It is preferable, usually, that the study of French should be preceded by that of Latin. The attention of teachers is called to the report of the Committee of Twelve of the Modern Language Association of America. This is published in book form by D. C. Heath & Co., and contains an extremely valuable discussion of the teaching of French and German.

## HISTORY AND CIVICS.

### First Year—Ancient History.

A good text in Ancient History should be completed in this year. Preferably the text should continue the narrative to the death of Charlemagne. Careful attention should be given to the important points in the history of Egypt, and the nations of Western Asia. Attention should be directed to the recent discoveries of new material bearing upon these ancient civilizations.

Special attention should be given to the history of Greece and Rome as the two nations of ancient times from which modern nations have profited most largely. The high development of Greek

thought and culture—Philosophy, Literature, Science and Art—should be especially noted. The causes of her loss of intellectual supremacy should be traced. Let it be noted that Greece contributed little of value to political thought or practice.

The practical administrative capacity of the Roman deserves emphasis. The steadily increasing territory of the nation, the development of her system of administration of the provinces, her treatment of subject nations, and her system of laws and administration of justice all deserve close attention. The political growth and subsequent decadence of the nation, together with the changes in its form of government are all important.

In the work of this year, as, indeed, throughout the entire study of history, the attention should not be fixed too closely upon political development alone, but the student should recur time and again to the social conditions, the religious beliefs, the relations of different classes of society, the administration of justice, the recreations and amusements of the people, the home and family life, trade and commerce, agriculture and manufactures as carried on by the people of the different nations. The study of political organization alone, gives one a very inadequate idea of the real history of any period.

The work of this year while thoroughly important in itself, should be conducted in the main, as a preparation for the later work of the course. Care should be taken at the outset to develop in the pupil methods and habits of study. In many cases the need is to teach how to study the subject, before attempting to make any great progress in the text. Collateral reading and research work should be carefully selected and not too great in amount, though there is an abundant wealth of topics for such work. Students should begin to keep note-books, but not too much of this work should be done in the first year, and pupils should be carefully directed in the materials to be preserved in their books. Constant drill on the main facts and on carefully prepared outlines should be maintained.

Many of the suggestions made with reference to the study of United States history will be applicable here also. The necessity for additional texts and for the collection of supplementary material will be very apparent. Maps and diagrams should be freely used. Lantern-slides, pictures, charts, and diagrams may all be made to contribute to the clearness and definiteness of one's historical knowledge.

**Second Year—Mediaeval and Modern History.**

*Mediaeval History.* This year's course should be a direct continuation of the preceding. Beginning with the death of Charlemagne in 814 A. D., the development of civilization should be carefully traced to the present time. The period is difficult because of the number of states rising out of the ruins of the Roman Empire and the different rates at which they advance. Care should be taken to give a broad view of the general conditions prevailing in any period, together with the special features of any country. The emphasis should be put upon the great movements; as the growth and influence of the Christian church; the rise of the papacy; the monastic institutions; the development of the religious orders; the Crusades; the social condition of the people; the rise of Feudalism; the distribution of wealth; the development of trade and industry; the rise of the Free Cities; and the struggle of the people for political and civil rights. As this period draws toward a close, attention should be given to the more rapid advance toward national consciousness of the various people, the differentiation among them which has developed into the modern nations of Europe, and the Revival of Learning which is the fore-runner of the great educational development of modern times. Modern history is rooted deeply in Mediaeval history and is a continuous stream with it. Care should be taken to show that there are no abrupt breaks in the chain of historic events and that divisions are rather conveniences of chronology than distinctions of historic movements.

*Modern History.* This period dates from about the middle of the 15th Century. In the general survey of the world it is the most important period. Movements which began in the Mediaeval period reach their culmination in this. It is the most complex period because of the great number of prominent events and the unequal rates at which great movements proceed in different countries. The nations of the present day develop. Great inventions and discoveries characterize its beginning. The knowledge of the world increases. The Reformation creates a new set of religious conditions and profoundly modifies human thought in all lines. The people begin to struggle more strongly and clearly for their political and civil rights; democracy begins to take its rise, and tyranny in both church and state is broken down. While the reformation of religious thought and practice, and the evolution of modern polit-

ical ideas seem to be the great themes of this period, careful attention should be paid to the industrial and commercial growth of the nations, to the improved conditions of society, to the colonization of new countries, to the conflicts of nations with each other for territory, and to the growing spirit of amity which now prevails. It is impossible to particularize all the topics for this period, only the chief lines of development have been indicated above.

"We are what the past has made us; the results of the past are ourselves." The work of these two years should aim to show how, and to what extent this is true.

### Third Year—English History.

The purpose of this year's study should be to show more particularly, by the history of this one nation, the development of modern conditions. England is a representative nation. She affords the most interesting study in the growth of democratic ideas both in religion and government. The steps in her development are clearly distinguishable, the contents distinctly marked, and the results clearly definable. The choice of English history is appropriate because her development is evolutionary, rather than revolutionary; her progress has been a steady movement, and she has been more forward in the development of democratic ideas than other nations. She is, also, the more direct source of our own political ideas and institutions than any other nation. England, through the United States and through her great colonies, has done much to democratize both church and state and to make possible the rights of the individual man.

Attention should be given to the great documents, the charters of English liberty, to the limiting of the powers of the Monarchs, to the development of the English Church, the relations of the parts of Great Britain to each other, to the establishment of her colonial possessions, to her political policy, to social conditions, poor laws, the administration of justice, public and higher education, to manufactures, trade and commerce.

### Fourth Year—American History and Civics.

Devote half the year to each subject. The order in which they are taken up may be at the option of the instructor. Perhaps the study of the history with reference to the growth and development

of our government is the best preparation for the study of civics. Use separate texts for each.

*American History.* The purpose of this half year's work should be to trace the larger movements of our history such as the problems and conflicts of the colonizing period; the contest of the various nations for portions of the territory of the New World; the supremacy of the English Colonies; the growing spirit of antagonism between England and the American Colonies; the causes and methods of concerted action by colonies culminating in the Declaration of Independence; the Articles of Confederation and their failure; the preparation and adoption of the Constitution; the development of national consciousness; the earlier relations with foreign nations; the development of national policies; the rise of political parties; the growth of slavery and its final overthrow; the territorial expansion of the nation; the various policies for the development of the resources of the country; the use and conservation of natural resources; relations to foreign nations and the rise of the United States to the position of a world power.

In this connection, too, the manner of life of the people, their means of travel and communication, the development of literature and art, religious and political beliefs, and the great educational system of the country, should not be overlooked.

Commercial and industrial conditions should be traced from the beginning of the nation. Exports and imports, tariffs, agriculture, money and banking, manufactures, and domestic and foreign commerce, are all vital themes.

The period since 1870 is one of special complexity, and requires careful treatment. Industrial and social conditions rapidly change, the era of "big business" begins with the formation and growth of trusts and combinations, and the relations between capital and labor become very prominent.

The whole study of American history in this year should be conducted with the view of throwing light upon present conditions, and pointing the way to social and industrial betterment. Attention should be given to the discussion of current questions as they are treated from time to time in the magazines and reviews.

*Civics.* The study of the form of government under which we live is one of the most practical of subjects. The preceding study of U. S. History should have laid the foundation for this work, and should have disposed of much of the historical element of it.

The half year's work should aim at a clear notion of the dis-

tribution of powers between the different branches of government, of the extent of the power of each, of the new questions arising calling for re-discussion of these various powers and of the present tendencies in their exercises. The relative power of state and national governments should be treated as fully as possible. The whole treatment should tend to show the growth of the constitution to meet the new questions which arise, and to show, that, while we have a written constitution legally amendable only in certain ways, we have found ways of interpreting it so as practically to justify every extension of power that we have found necessary.

Besides this study of national and state governments a study should be made of the local county and municipal governments as being the forms of rule under which the new citizen enters most directly into the civic and political life of the community and nation.

The practical value of the whole course in history should culminate in this latter half year's work. Pupils should be taught to see that the form of government in our country is the outgrowth of all previous forms and experiments in government; that it represents the greatest liberty of all, and the freest participation of all in governmental affairs, but that the permanency of any form of government depends upon the character of its citizenry.

While the historical side of the study of civics is very attractive, it is, perhaps, better to put the main emphasis on the study of local conditions. He is a good citizen who discharges his duties toward his own community first wisely and well. Sanitary homes and schools, good roads, street cleaning, factory inspection, compliance with the requirements of health boards, pure food regulations, full weights and measures, provision for the safety of person and property, proper care of the poor, and of defectives and delinquents, juvenile courts, houses of correction and detention homes, curfew regulations, the responsibility of the leading men of any community to lead in movements for its betterment, the habits of obedience to law, of thrift and saving, care and prudence in the conduct of business and the handling of property, all these are topics of vital interest and of more importance than much of the discussion of historical developments.

In both history and civics the work should be made alive. Pupils should see the actors on the stage. They should reproduce in imagination the scenes and conditions described and should feel the right or wrong of the deeds done. To this end special devices

may be introduced, special reports prepared, assigned readings given, debates rendered, etc. In civics, institutions may be visited, special reports prepared on various departments of city or county government, city or county officials secured to explain the work of their department, etc. The map and the blackboard should be in constant use, the note-book should be used with discrimination.

*Reference Books in History and Civics.*

Ancient History:

Myers—Ancient History (Revised Edition). Ginn & Company.
Rome: Its Rise and Fall. Ginn & Company.

Morey's—Outlines of Greek History; Outlines of Roman History. American Book Company.

Botsford—Ancient History for Beginners. Macmillan Company.

West—The Ancient World. Allyn & Bacon.

Guerber—Myths of Greece and Rome. American Book Company.

Bulfinch—Age of Fable. Lee Publishing Co.

Creasy—Fifteen Decisive Battles of the World. Burt.

Wheeler—Alexander the Great. Putnam & Company.

Froude—Life of Julius Caesar. Harper Bros.

Plutarch—Lives of Noble Grecians and Romans. Little, Brown & Company.

Mediaeval History:

Cox—The Crusades. Longmans, Green & Co.

Emerton—Introduction to the Study of the Middle Ages; Mediaeval Europe. Ginn & Company.

Robinson—History of Western Europe; Readings in European History. Ginn & Comapny.

Bryce—The Holy Roman Empire. Macmillan Company.

Guerber—Myths of Northern Lands. American Book Company.

Harding—Essentials in Mediaeval and Modern History. American Book Company.

Munro—History of the Middle Ages. D. Appleton & Company.

Adams—Civilization During the Middle Ages. Chas. Scribner's Sons.

Oman—The Dark Ages. Putnam & Company.

Tout—The Empire and the Papacy. The Macmillan Company.

Milman—History of Latin Christianity. Armstrong Pub. Co.

Civics:

Andrews—Manual of the Constitution. American Book Company.

Hinsdale—The American Government. Werner School Book Company.

Bryce—The American Commonwealth. The Macmillan Company.

Cooley—General Principles of Constitutional Law. Little, Brown & Co.

Forman—Advanced Civics. The Century Company.

Fiske—Civil Government in the United States. Houghton, Mifflin & Co.

Wilson—The State. D. C. Heath & Company.

Hughes—The Teaching of Citizenship. W. A. Wilde Company.

Lewis—History and Government of W. Va. American Book Co.

Hall—The Rending of Virginia. Mayer & Miller, Chicago.

Goodnow—City Government in the U. S. The Century Company.

Wilcox—The American City. The Macmillan Company.

Fuller—Government by the People. The Macmillan Company.

Bullock—Introduction to the Study of Economics. Silver, Burdette & Company.

Macy—Party Organization and Machinery. The Century Company.

Adams & Summer—Labor Problems. The Macmillan Company.

Fairlie—Local Government in Counties, Towns and Villages. The Century Company.

English History:

Church—The Story of Early Britain. Putnam & Company.

Freeman—Short History of the Norman Conquest. Oxford Press.

Green—Short History of the English People. American Book Company.

Henderson—Side Lights on English History. H. Holt & Co.

Moran—Theory and Practice of the English Government. Longmans, Green & Company.

Payne—History of European Colonies. The Macmillan Company.

Stubbs—Constitutional History of England, (3 vols.). Oxford Press.

Colby—Selections from the sources of English History. Longmans, Green & Company.

Ransome—Advanced History of England. The Macmillan Company.

Cheney—Readings in English History. Ginn & Company.

Oman—England in the Nineteenth Century. Longmans, Green & Company.

Creighton—The Age of Elizabeth. Longmans, Green & Company.

Gardiner—The Puritan Revolution. Chas. Scribner's Sons.

Brooke—Primer of English Literature. American Book Company.

Bagehot—The English Constitution. D. Appleton & Company.

## SCIENCE.

### PHYSICS.

It is probably better that physics be omitted from the high school course rather than crowd the course simply for the sake of giving pupils an extra credit in college, or to intrust its presentation to a teacher who has not had at least one year's work in physics in a college having a good laboratory. In our smaller high school it is generally conceded that pupils will receive more practical good from a course in chemistry than physics. However, where it is practicable to have both let plans be made to do them well. The work in this subject should consist of three parts: (1) Recitation work based upon a good text book and illustrated by experiments—these experiments performed by the teacher, and in some cases repeated by the pupils, should be largely qualitative; (2) Laboratory work in which the pupils perform the experiments under the careful supervision of the teacher; (3) A note book containing an account of the experiments performed by the pupil.

A study of the text alone is of little value unless supplemented by numerous experiments. Each one performed by the teacher in class should be participated in by as many pupils as possible and repeated until it is clear to everyone. The most satisfactory division of time between the class room and the laboratory is three single periods per week in the former and two double periods in the latter.

The laboratory should be installed in a suitable room—good light and ventilation being essential. The equipment should be good but not necessarily expensive. In regard to equipment Professor C. W. Waggoner says:

"To many, the word "laboratory" carries a picture of some complicated piece of glassware or an array of highly-polished brass, and many a teacher has offered "lack of apparatus," as an excuse for not giving laboratory instruction. Too often a great physical phenomenon is so bound up with an imposing piece of apparatus that its real significance is lost entirely. To many a science teacher the lure of the instrument maker's catalogue is fatal. Often a board, nicely painted, with a few pegs in it is shipped a thousand miles, labeled "physical apparatus," at a cost of one dollar and one-half, when the village carpenter could furnish its duplicate for fifteen cents.

The village blacksmith can furnish material for all the magnets needed in a physical laboratory, at practically one-tenth the price charged by any manufacturer of physical apparatus, and this same blacksmith has usually all the tools necessary for the construction of such apparatus as is needed in a moderate sized high school.

Too often one hundred dollars, or more, is used to purchase a "Physical Demonstration Cabinet," heralded to do all the possible experiments in physics, (and one might add, none of them well), when this same amount of money in the hands of a well trained, enthusiastic teacher of physics would be the means of giving *individual* labatory work, and make concrete and real some of the vital truths of the physical sciences.

It is posssible with a few carpenter's tools and the facilities usually found in a repair or blacksmith's shop to construct enough physical apparatus to give a creditable laboratory course of instruction.

Now it is not meant that the teacher of physics, who very often teaches all the sciences and mathematics as well, should himself attempt to construct all of his laboratory apparatus; a carpenter or a plumber can often accomplish in a few moments a task that would cost hours of the teacher's time. Not long ago a young man presented to the writer for his inspection, a small induction coil which he had made while a student in an elementary course in physics. This coil while "homemade" in every respect, was of sufficient size to give excellent service in igniting the gas for a motor-driven pleasure launch.

There are few boys of high school age who will lose interest in physics if given the opportunity to construct some simple pieces of apparatus; and every successful teacher has seen the glow of

pleasure and satisfaction come to a pupil who has grasped, unaided, some great fundamental truth. It is impossible in a paper of this kind to go far into details as to the construction of apparatus, but the perusal of any standard laboratory manual of physics will show the possibilities along this line.

There are some teachers who say that students do not properly appreciate and respect "home-made" apparatus. To such, one can only answer that the fault lies with the teacher, not with the taught; for the apparatus is not greater than the fundamental truths which it is intended to demonstrate, and sorry indeed is the plight of the teacher who holds his pupil's interest only through the awe of complicated and imposing pieces of apparatus.

Again, the high school laboratory of physics need not be confined to a room set aside for that purpose; for every electric light plant, every foundry, the ice plant, every manufacturing industry is a laboratory where one may see and be taught, the applications of the fundamental principles of physics."

The pupil should be required to perform at least thirty (30) individual experiments. About half of these should be qualitative and the rest quantitative. The work should emphasize the explanation of natural phenomena in a manner which can be appreciated by high school pupils of average ability, and should not over emphasize the mathematical aspects of the subject. Pupils should be encouraged to make use of the simple principles of algebra and geometry in order to reduce difficulties of solution.

With respect to note book work the Board expresses but little sympathy with any rigid, mechanical form of arrangement to which all experiments must be forced to conform. The pupil should be encouraged to describe the apparatus until he is familiar with it, to set down in good English the method of procedure, and to state clearly the results obtained. Much in the way of arrangement of the form should be left to the individuality of the pupil. Good clear English should be required and made the standard test for all note book exercises.

### List of Experiments.

*C. W. Waggoner.*

The following list of experiments was adopted by the College Entrance Examination Board in 1909. Thirty representative experiments (marked *) have been selected from this list, and to assist such schools as have no facilities for laboratory instruction, a complete specification of laboratory apparatus

is given under each selected experiment to serve as a guide in the purchase of equipment. The prices quoted are approximate, and it must be remembered that the apparatus specified is a minimum. The list of apparatus specified is sufficient for ten students, working in pairs, and will be found in harmony with the requirements of any good high school laboratory manual.

Articles marked (†) can usually be secured locally to good advantage.

*Exp. 1. Weight of Unit Volume of Substance, Prism or Cylinder.
5 Harvard trip scales or other equal arm balances, $30.00.
5 sets of metric weights in block, 500 to 1 gram, $10.00
10 Meter sticks, maple, $2.75.
†Rectangular blocks and cylinders.

*Exp. 2. Principles of Archimedes.
5 Overflow cans, $4.50.
5 Equal arm balances, (Listed in Exp. 1.)
†10 Glass tumblers (250 c. c.)
†Solids denser than water, weighing from 100 g. to 250 g. Use stone, coal, etc.
†Solids less dense than water. Use blocks of wood, apples, etc.

*Exp. 3. Specific Gravity of a Solid Body that will Sink in Water.
5 Equal arm balances, (Listed in Exp. 1.)
5 Glass battery jars, capacity not less than 1 quart, (4 inches by 10 inches) 50c.
†5 Balance stands, home made.
†Solids weighing 100 to 250 g.—porcelain, solid glass, pieces of metal, stones, sulphur.

*Exp. 4. Specific Gravity of Liquid, Two Methods, (Bottle and Displacement Methods.)
5 Equal arm balances, (Listed in Exp. 1.)
†5 Two oz. wide mouth bottles with glass stoppers, 50c.
†Liquids of various densities—salt water, milk, denatured alcohol, gasoline, kerosene.
By displacement method.—
5 Glass jars (Listed in Exp. 3.)
†Solids in Exp. 3.

Exp. 5. Specific Gravity by Balancing Columns.

*Exp. 6. Boyle's Law.
5 Boyle's Law tubes, funnel top, large bore, $5.00, or if it is desired these tubes may be home made as in Millikan and Gale, from glass tubing, 1 m. m. inside diam., and 100 cm. long.
5 Meter sticks, (Listed in Exp. 1.)
5 Pounds of clean mercury, $5.00.
1 Mercury barometer, metric, adjustable, $7.50.

Exp. 7. Density of Air.

EXP. 8. HOOKE'S LAW.

EXP. 9 STRENGTH OF MATERIALS.

*EXP. 10. THE STRAIGHT LEVER, PRINCIPLE OF MOMENTS.
5 Meter sticks, (Listed in Exp. 1.)
5 Sets of weights, (Listed in Exp. 1.) hook weights are convenient.

*EXP 11. CENTER OF GRAVITY AND WEIGHT OF LEVER.
5 Meter sticks, (Listed in Exp. 1.)
†Wood prisms, each face 2 inches by 1 inch, load one end of meter stick with a weight to destroy symmetry.

*EXP. 12. PARALLALOGRAM OF FORCES.
15 Spring balances, metric 250 grams, flat back $10.00.
5 Meter sticks, (Listed in Exp. 1.)
†15 Rectangular wood blocks, (Listed in Exp. 1.)

EXP. 13. FOUR FORCES AT RIGHT ANGLES IN ONE PLANE.

*EXP. 14. COEFFICIENT OF FRICTION BETWEEN SOLID BODIES, ON A LEVEL AND BY SLIDING ON AN INCLINE.
†5 Smooth boards, 24 in. x 6 in. x 7-8 in.
†5 Smooth blocks, (Listed in Exp. 1.)
5 Equal arm balances and weights, (Listed in Exp. 1.)
5 Spring balances, (Listed in Exp. 2.)
†5 Large sheets of paper.

*EXP. 15. EFFICIENCY TEST OF SOME ELEMENTARY MACHINE, EITHER PULLEY, INCLINED PLANE OR WHEEL AND AXLE.
10 Single pulleys, (Pressed steel recommended), $2.25.
10 Double pulleys, (Pressed steel recommended), $4.00.
5 Sets of weights, (Listed in Exp. 1.)
20 Two-inch iron clamps, to be used in supporting all kinds of apparatus, $3.50.
†100 Feet small braided cotton cord.

*EXP. 16. LAWS OF PENDULUM.
5 Pendulum balls, iron, one inch in diameter, drilled, 50c.
5 Meter sticks, (Listed in Exp. 1.)

EXP. 17. LAWS OF ACCELERATED MOTION.

*EXP. 18. THE MERCURY THERMOMETER; RELATION BETWEEN PRESSURE OF STEAM AND ITS TEMPERATURE.
5 Copper boilers and burners (Apparatus A), $21.25.
10 Chemical thermometers, enclosed scale,—10 degrees to 110 degrees C.), $3.50.
†10 Mercury pressure guages.

5 Screw pinch cocks, $ .60.
25 Feet of rubber tubing, ¼ in. diameter, $2.50.
1 Barometer, (Listed in Exp. 6.)
5 Feet, 3-16 inch, rubber tubing for connection 40c.
If illuminating or natural gas is not available, some form of alcohol lamp, or a good gasoline stove may be used to supply heat.

*EXP. 19. LINEAR EXPANSION OF A SOLID.
5 Sets of linear expansion apparatus, Central Sc. Co., type, $15.00. These may be made at home at very little cost, following the type described in Millikan and Gale.
5 Thermometers, (Listed in Exp. 18.)
5 Copper boilers, (Listed in Exp. 18.)
5 Meter sticks, (Listed in Exp. 1.)

EXP. 20. INCREASE OF PRESSURE OF GAS AT CONSTANT VOLUME.

*EXP. 21. INCREASE IN VOLUME OF GAS HEATED AT CONSTANT PRESSURE.
5 Straight glass tubes, containing dry air with mercury seal, to be used vertically. The glass tubes suggested in Exp. 6, may be used, $15.00
5 Chemical thermometers, (Listed in Exp. 18.)
5 Meter sticks, (Listed in Exp. 1.)
5 Boilers and burners, (Listed in Exp. 18.)
†1 Common water pail or tin can to hold the ice or snow while cooling the enclosed air columns.

*EXP. 22. THE HEAT OF FUSION OF ICE.
5 Calorimeters, $4.50.
5 Thermometers, (Listed in Exp. 18.)
5 Equal arm balances, (Listed in Exp. 1.)
†1 Tea kettle for heating water.

EXP. 23. COOLING THRU CHANGE OF STATE, SOLIDIFICATION.

EXP. 24. HEAT OF VAPORIZATION OF WATER.

*EXP. 25. DETERMINATION OF DEW POINT.
5 Calorimeters, (Listed in Exp. 22.)
10 Thermometers, (Listed in Exp. 18.)
†Ice and Salt.

*EXP. 26. SPECIFIC HEAT OF A SOLID.
5 Calorimeters, (Listed in Exp. 22.)
10 Thermometers, (Listed in Exp. 18.)
5 Equal arm balances, (Listed in Exp. 1.)
5 Boilers and burners, (Listed in Exp. 18.)
†10 Pounds Lead shot, $1.00.

EXP. 27. VELOCITY OF SOUND.

*EXP. 28. WAVE LENGTH OF SOUND.
5 Tuning Forks, A. 435, $5.00.
5 Meter sticks, (Listed in Exp. 1.)
5 Glass tubes, 13 inches long and not less than ¾ inch in diameter, inside.
5 Glass battery jars, (Listed in Exp. 3.) use battery jars full of water to vary the column of air, by raising or lowering the glass tube in the water.

EXP. 29. NUMBER OF VIBRATIONS OF A TUNING FORK.

EXP. 30. USE OF PHOTOMETER.

*EXP. 31. IMAGES IN A PLANE MIRROR.
5 Mirrors, thin glass, about 15 cms. x 3 cms., 50c.
5 Meter sticks, (Listed in Exp. 1.)
5 Wood blocks for mirror supports, (Listed in Exp. 1.)
5 Paper protractors, 50c.

*EXP. 32. IMAGES FORMED BY A CONVEX MIRROR.
5 Cylindrical mirrors, nickel plated, $2.50.
5 Meter sticks, (Listed in Exp. 1.)

*EXP. 33. IMAGES FORMED BY A CONCAVE MIRROR.
5 Cylindrical mirrors, nickel plated, (Listed in Exp. 32.)
5 Meter sticks, (Listed in Exp. 1.)

*EXP. 34. INDEX OF REFRACTION OF GLASS.
5 Glass refraction plates, 7.5 cm. x 10 cm., $2.50.
5 Meter sticks, (Listed in Exp. 1.)

EXP. 35. INDEX OF REFRACTION OF WATER.

*EXP. 36. FOCAL LENGTH AND CONJUGATE FOCI OF A CONVERGING LENS.
5 Converging lenses, 12 cm. focus, 80c.
5 Lens holders, $1.50.
†10 Paper screens.
5 Meter sticks, (Listed in Exp. 1.)
†10 Support blocks for meter sticks.
†Candles.
†5 Pieces of wire gauze, 5 cm. square, for objects.

EXP. 37. SHAPE AND SIZE OF REAL IMAGE FORMED BY A LENS.

EXP. 38. MAGNIFYING POWER OF A LENS.

EXP. 39. CONSTRUCTION OF MODEL TELESCOPE OR COMPOUND MICROSCOPE.

*EXP. 40. STUDY OF MAGNETIC FIELD.
5 Bar magnets, 15 cm. long, $2.00.
†1 Pound, iron filings.
1 Dozen Tracing Compasses, about ½ inch in diameter, $1.25.

EXP. 41. MAGNETIC INDUCTION.

*EXP. 42. STUDY OF A SINGLE FLUID VOLTAIC CELL.
5 Glass tumblers, (Listed in Exp. 2.)
5 Zinc strips, 60c.
5 Copper strips, 60c.
5 Lbs. concentrated sulphuric acid, 55c.
1 Lb. Mercury, (Listed in Exp. 6.)
5 Simple galvanoscopes with compasses, $12.50.
The galvanoscopes may be constructed at home by using wire and the compasses listed in Exp. 40.

*EXP. 43. STUDY OF A TWO FLUID VOLTAIC CELL.
5 Daniell cells consisting of:—
5 Battery jars (Listed in Exp. 3.)
5 Porous cups, 2 inches by 4 inches, $1.50.
5 Zincs, (Listed in Exp. 42.)
5 Copper plates, (Listed in Exp. 42.)
5 Galvanoscopes, (Listed in Exp. 42.)
5 Equal arm balances, (Listed in Exp. 1.)
5 Lbs. Copper sulphate, crystals, 60c.
Sulphuric acid, (Listed in Exp. 42.)

*EXP. 44. THE MAGNETIC EFFECT OF AN ELECTRIC CURRENT.
5 Daniell cells, (Listed in Exp. 43.)
5 Tracing compasses, (Listed in Exp. 40.)
†5 Electromagnets, local make.

EXP. 45. ELECTROLYSIS.

*EXP. 46. LAWS OF ELECTRICAL RESISTANCE OF WIRES; VARIOUS LENGTHS, CROSS SECTION AND IN PARALLEL.
This experiment should follow Exp. 48, and the resistances should be measured by the bridge method.
5 Daniell cells, (Listed in Exp. 43.)
5 Wheatstone's bridges, (Listed in Exp. 48.)
5 D'Arsonval Galvanometers, (Listed in Exp. 48.)
5 Five ohm resistance coils, (Listed in Exp. 48.)
5 Ten ohm resistance coils, (Listed in Exp. 48.)
½ Lb. copper wire, No. 30, double cotton covered, $1.00.
½ Lb. German silver wire, No. 24, double cotton covered, $1.40.
¼ Lb. German silver wire, No. 30, double cotton covered, $1.30
The German silver wire all to be cut in two meter lengths, the copper wire to be cut in ten meter lengths.

EXP. 47. RESISTANCE MEASURED BY THE VOLT—AMMETER METHOD.

*EXP. 48. RESISTANCE MEASURED BY WHEATSTONE'S BRIDGE.
5 Dry cells, (Listed in Exp. 49.)
5 Wheatstone's bridges, (slide wire form), $15.00.

5 D'Arsonval galvanometers, $12.50.
5 Five ohm resistance coils, $2.50.
5 Ten ohm coils, $2.50.

*EXP. 49. BATTERY RESISTANCE, COMBINATION OF CELLS.
5 Dry cells, $3.00.
5 Daniell cells, (Listed in Exp. 43.)
5 Galvanoscopes with compasses, (Listed in Exp. 42.)
5 Ten ohm resistance coils, (Listed in Exp. 48.)

EXP. 50. STUDY OF INDUCED CURRENTS.

EXP. 51. POWER OR EFFICIENCY TEST OF A SMALL ELECTRIC MOTOR.

Approximate cost of apparatus ..... $ 175.00

## CHEMISTRY.

### One Year.

The course in chemistry should extend through the year with three recitations and two double laboratory periods per week. A standard textbook should be completed and the laboratory work should be arranged to illustrate the statements of the textbook.

During the recitation the statements made in the textbook should be discussed with and explained to the student and illustrated by the more difficult experiments.

In the laboratory the student should perform experiments to illustrate the statements made in the text-book and should become familiar with the substances and chemical changes about which he is studying. Each student should work independently of the others and should be taught to observe carefully, think accurately, and reason correctly. Careless and slovenly work should not be tolerated for a moment. A note book should be kept showing the quality and quantity of the work done. It should be written in the laboratory at the time and as the experiment progresses and the notations should be made in the following order:—

1. A brief clear statement of the purpose of the experiment.
2. A short description of the experiment with a plain outline drawing of the more important parts of the apparatus.
3. Accurate observations should be made as the experiment progresses and a true record made of the facts observed.
4. When the experiment is completed, the inferences and conclusions which can be based on these facts should be written out in full.

If the laboratory facilities permit, a few quantitative experiments may be performed, as these, *if well done,* give the student an idea of the need of care in his work and by them he will get a better idea of how some of the laws about which he is studying, were obtained.

Laboratory work is a very important part of chemistry and no attempt should be made to teach the subject until a well equipped laboratory is available. It should be large enough and supplied with sufficient apparatus and chemicals to enable each student to work by himself. Good light, solid tables, gas connections, water both distilled and ordinary, convenient sinks, a stock room for apparatus and chemicals and a hood with a good draft, are essentials. The laboratory supplies should be purchased from a reliable firm. If the amount to be bought would cost $200.00 or more a considerable saving can be made by ordering three or four months before the materials will be needed and having them imported free of duty. All educational institutions have the privilege of importing goods for teaching purposes without paying the import duty.

Chemical formulas should not be introduced into the study too soon, for if they are the student may get an exaggerated idea of their importance. When they are introduced the fact should be emphasized that they are only a shorthand method of writing the name which, however, at the same time shows certain experimental facts about the compound. For example he learns that sulfuric acid is a heavy oily liquid which has certain chemical properties. He can then learn that a short way of writing the name of this substance is $H_2\ SO_4$. This formula should at once bring to his mind this same oily substance and at the same time remind him that the substance contains by weight two parts of hydrogen, 32 parts of sulphur,and 64 parts of oxygen in every 98 parts of the substance. It also reminds him of the constancy of weight, &c. Formulas, equations and problems are very important if not used too soon and if properly explained when they are introduced, but like most good things they are subject to abuse and may lead to more harm than good if not properly used.

The science teacher should not be overworked. A teacher who does the work in chemistry and physics in a high school and does it properly will have very little time to devote to any other subjects.

The high school should have some library books on chemistry and the student should be directed and encouraged in their use. The following may be suggested:—

*Text books and laboratory manuals.*

Remsen's Briefer Course, Holt..... $1.12
Elementary Modern Chemistry, Ostwald and Morse,—Ginn $1.00
An Elementary Text Book of Chemistry, Morgan and Lyman,—The Macmillan Company .....
Introduction to Chemistry, Ostwald, Hall & Williams, Wiley $1.50
Laboratory Manual, Dennis and Clark,—American Book Co. $0.50

*Reference Books.*

Outlines of Chemistry, L. Kahlenberg,—Macmillan..... $2.60
College Chemistry, Alexander Smith,—The Century Co.... $2.15
The Principles of Inorganic Chemistry, Ostwald, MacMillan $6.00
Chemical Theory for Beginners, Dobbin and Walker, Macmillan ..... $0.70
Chemical Lecture Experiments, Benedict,—Macmillan..... $2.00
The Electrolytic Dissociation Theory, Talbot,—Macmillan $1.25
A Text Book of Sanitary and Applied Chemistry, Bailey,—Macmillan ..... $1.40
John Dalton and the Rise of Modern Chemistry, Roscoe,—Macmillan ..... $1.25
Teaching of Chemistry and Physics, Smith and Hall,—Longmans ..... $1.50
Modern Science Reader, Bird,—Macmillan ..... $1.10
History of Chemistry, Venable,—Heath..... $1.00

In each case the latest edition should be purchased.

## LIST OF EXPERIMENTS.

Quality rather than quantity should count in this work but the student should do at least thirty-five experiments similar to these indicated below.

Experiment 1. Three states of matter, temperature of melting ice and of boiling water, the effect of dissolving various substances in water on its melting and boiling points.

Ex. 2. Illustrate mixtures, solutions, and chemical compounds, their similarities and differences.

Ex. 3. Burning of a candle, a piece of wood, magnesium ribbon, &c., in the air and a study of the products formed.

Ex. 4. Preparation of oxygen in at least three ways and a study of its properties.

Ex. 5. Study the barometer and the effect of pressure and temperature on gases.

Ex. 6. The preparation of hydrogen by sodium on water, sulfuric acid on zinc and hydrochloric acid on aluminum, and a study of the properties of the gas.

Ex. 7. Study the other products of the reactions in experiment 6.

Ex. 8. Synthesis of water both qualitative and quantitative.

Ex. 9. Study oxidations and reductions.

Ex. 10. Study the purification of water by distillation using first salt, then alcohol, and finally ammonia in the water. Also study filtration first using salt and then some suspended matter in the water.

Ex. 11. Compare the different solubilities of different substances in various solvents, and study unsaturated, saturated, and supersaturated solutions.

Ex. 12. Study reversible reactions by first making hydrogen and iron oxide by passing steam over iron, and then drying out the tube and showing that by passing hydrogen over the iron oxide metallic iron and water are again formed.

Ex. 13. Preparation and properties of hydrochloric acid.

Ex. 14. Preparation and properties of Chlorine.

Ex. 15. Preparation of potassium hypochlorite and potassium chlorate.

Ex. 16. Preparation of sodium chloride from the metal and chlorine, the metal and hydrochloric acid, and from sodium hydroxide and hydrochloric acid.

Ex. 17. The preparation and properties of at least three other chlorides.

Ex. 18. Heat a weighed amount of copper in oxygen until the copper is completely converted into copper oxide, weigh again and calculate the simplest formula for copper oxide.

Ex. 19. Determine the percentage of the oxygen in the air.

Ex. 20. Preparation and properties of nitric acid.

Ex. 21. Preparation and properties of nitric oxide and nitrogen peroxide.

Ex. 22. Preparation and properties of nitrous oxide.

Ex. 23. Preparation and properties of ammonia.

Ex. 24. Ammonia and water, sodium and potassium on water, bases, neutralization.

Ex. 25. Preparation and properties of carbon dioxide.

Ex. 26. Preparation and properties of carbon monoxide.

Ex. 27. Study the burning of charcoal in much oxygen and then in small amount of oxygen.

Ex. 28. Show that plants absorb carbon dioxide and give off oxygen in the day time and reverse at night.

Ex. 29. Ferment grape sugar and study the products.

Ex. 30. Preparation and properties of bromine.

Ex. 31. Preparation and properties of iodine.

Ex. 32. Study the relative stability of hydrochloric acid, hydrobromic acid, and hydroxidic acid.

Ex. 33. Study the physical and chemical properties of sulfur.

Ex. 34. Preparation and properties of hydrogen sulfide.

Ex. 35. Study the effect of passing hydrogen sulfide into solutions of a variety of salts.

Ex. 36. Make sulphur dioxide by two or three different ways and study its properties.

Ex. 37. Study sulfuric acid and make several sulfates.

Ex. 38. Study sodium and potassium compounds.

Ex. 39. Study calcuim, barium, and strontium compounds.

Ex. 40. Study the action of carbon dioxide on lime water and on calcium carbonate.

Ex. 41. Study tin and lead compounds.
Ex. 42. Study aluminum compounds, mordants, &c.
Ex. 43. Study copper and silver compounds, photography.
Ex. 44. Study iron compounds.
Ex. 45. Study chromium salts.
Ex. 46. Make potassium chromate and dichromate.
Ex. 47. Made potassium manganate and permanganate.

## BIOLOGY.

### One Year.

Biology deals wholly with living organisms. It includes elementary botany, zoology, and human physiology and hygiene. The subjects are sufficiently closely related to afford a connected study for a year of desirable work. The aim of biology is to give pupils a general view of the wide range of forms in plant and animal life, to lead them to observe the many processes carried on by plants and animals and to study only so much of the structure as is necessary to understand clearly such processes, and to help the pupils to a reasonable knowledge of the human body and the way to care for it.

Biology should be pursued strictly as an inductive science. The subject matter should be present to the senses. Field work, laboratory work and actual study of specimens must be relied upon. Textbook study alone of plants and animals is a waste of time and energy of both pupil and teacher. Textbooks should be used to guide and supplement field and laboratory study. If the teacher is not very well prepared to present the subject let him at least become a learner and together with the pupils pursue the subject as learners. In this way much may be accomplished; in fact, very often the best learning and teaching will result.

The study of biology should begin with some simple physical and chemical experiments to give clear, concrete notions of the principal elements and simple compounds of plant and animal life. These experiments should be performed as an introduction to the various topics to which they are most closely related. The order of study should be plant life, animal life, human physiology and hygiene. No outline of the subject by topics will be given here as any good textbook will furnish a desirable order for developing the subject.

The teacher of biology should be thoroughly prepared to present and develop the subject. He should have done college work in both the physical and biological sciences, especially the latter.

He should be at home in a laboratory or in field study and feel kenly that he is introducing his pupils into the richest and most productive of school studies.

Throughout the course such fundamental principles should be illustrated and presented as will keep the continuity and unity of the subject sufficiently clear in the mind of the learner. The student should know that he is studying one subject and not three separate subjects. To this end emphasis should be laid upon the unifying functions— nutrition, respiration, excretion, motion, sensation, and reproduction. These unifying ideas should be thoroughly established in the mind of the student. The following books are suggested for class and library use:

| | |
|---|---|
| Lloyd—The Teaching of Biology—Longmans Green & Co. | $1.50 |
| Boyer—Elements of Biology—Heath | .80 |
| Hargitt—Outlines of Biology—C. W. Bardeen | $1.00 |
| Sharpe—Laboratory Manual in Biology—American Book Co. | .75 |
| Ogden—Rural Hygiene—Macmillan | $1.50 |
| Brown—Physiology for the Laboratory—Ginn & Co. | .85 |
| Gulick—The Efficient Life—Doubleday & Page | $1.20 |
| Hough & Segwick—Elements of Hygiene and Sanitation—Ginn | $1.25 |
| Kellogg—The Animals and Man—Holt | $1.25 |
| Dodge—Elementary Practical Biology—American Book Co. | $1.80 |

## BOTANY.

One year should be given to botany. It should represent laboratory and field work, demonstrations and text book study. At least two double periods per week should be given to laboratory or to closely supervised field work.

The student should make his own observations and draw his own conclusions. The work should be descriptive and explanatory. The student should aim at the causal relation in all his botany work. Besides the knowledge and interest developed by the study, the student should gain confidence in the testimony of his own senses, belief in his reasoning from facts to conclusions, the habit of looking for the deeper meaning of things, and of inferring causes from effects and effects from causes.

An account of the study should be kept in a well planned note book. This laboratory note book should contain accurate drawings, precise and expressive descriptions, and clear and definite con-

clusions. The note book should show the quality and quantity of work done.

Modern botany requires a properly equipped laboratory. The laboratory should be well lighted, furnished with firm tables twenty-seven or twenty-eight inches high, and have sufficient shelves and cases at the sides of the room. There should be at least one-fifth as many microscopes as there are students in the class. While at work each student should have free access to a good microscope. With each microscope there should be provided a set of dissecting instruments, such as scalpel, forceps, scissors, needles and pipettes, besides glass slips, cover glasses, alcohol, reagents, etc.

Each school laboratory should contain a reference herbarium in which not only the species of native plants are preserved but also good specimens of the great types that do not grow in the region of the school.

Each high school should have a well selected library of botanical books. The following books are suggested:

Atkinson—Botany for High Schools—Holt ..... $1.25
Bergen—Foundations of Botany—Ginn & Co. ..... .60
Conn—Bacteria Yeasts and Moulds in the Home—Ginn & Co. ..... 1.00
Coulter—Plant Relations—Appleton & Co..... 1.10
MacDougal—Elements of Plant Physiology—Longmans.. 1.20
MacDougal—Nature and Work of Plants—Macmillan.... .80
Pinchot—Primer of Forestry, (2 parts),—U. S. Department of Agriculture. Free.
Sargent—Corn Plants—Houghton, Mifflin Co..... .75
Osterhout—Experiments with Plants—Macmillan..... 1.25
Leavitt—Outlines of Botany—American Book Co..... 1.00
Ganong—Teaching Botanist—Macmillan ..... 1.25

Bureau of Education Bulletin No. 1, 1911. Free. Washington, D. C.

N. E. A. Proceedings. Membership, $2.00 year, Irwin Shepard, Sec'y., Winona, Minn.

School Science and Mathematics, Chicago, $2.00. A monthly Journal.

## ADVANCED ZOOLOGY.

### One Year.

Zoology represents one year of consecutive study and pre-supposes general biology. There should be three class exercises and

two double laboratory periods per week. The class work should be planned according to some suitable text book and the laboratory work in keeping with some good manual.

The note book kept by the student should reflect the scientific method and tentative attitude in the study, as well as the quality and quantity of work done. The note book should contain clear, concise descriptions and accurate drawings.

The laboratory work should consist of regular laboratory and field study. The regular laboratory study should include a limited number of carefully selected types. The emphasis should be laid upon processes and activities as well as on the form. The study of structure should be to reval processes and adaptations and the principles of growth and development in evolution. The field study as in the case of botany must be well planned and supervised to have educative value. The teacher should visit the locality, determine upon the aim and purpose of the lesson according to the available material, and plan the lesson with care before the class is taken out. It is well to select a unit of environment and study it intensively.

Zoology properly taught is a highly educative subject and at the same time an economical science. No subject offers better opportunities for accurate observation, clear description, correct analysis and discriminating thinking than zoology; it may be one of the most valuable and attractive subjects in the High School. The economical side, as in botany, should be impressed upon the student. Zoology can use the same equipment as botany; the additional cost in the way of apparatus and supplies need not be considerable. The following types should be studied:

Amoeba.
Hydra.
Earthworm.
Crayfish.
Insect.
Snail or mussel.
Fish.
Frog or turtle.
Bird or
Mammal (cat).

A collection of local animals should be made by each school. The local fauna should be attractively displayed. This local museum should be used under the direction of the teacher in the same way

a library should be used, by definite references given the students and definite accounts rendered by the students for each reference.

Each high school should have a working zoological library of the best books suitable for high school students. The books should include a few text books and the laboratory manuals and reference books. The following are suggested:

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|---|---|
| Jordan Kellogg & Heath—Animal Studies—Appleton | $1.80 |
| Jordan & Kellogg—Animal Life—Appleton | 1.20 |
| Parker & Haswell—Manual of Zoology—Macmillan | 1.60 |
| Linville & Kelly—Text Book in General Zoology—Ginn | 1.50 |
| Hertwig—Manual of Zoology—Holt | 3.00 |
| Weed—Life Histories of American Insects—Macmillan | 1.50 |
| Merriam—Birds of the Village and Fields—Houghton Mifflin Co. | 2.00 |
| Holland—Butterfly—Doubleday, Page & Co. | 3.00 |
| Howard—Insect Book—Doubleday, Page & Co. | 3.00 |
| Jordan & Everman—Fish Book—Doubleday, Page & Co. | 4.00 |
| U. S. Department of Agriculture, Washington, D. C. | |
| Ditmars—The Reptile Book—Doubleday, Page & Co. | 4.00 |
| Dickerson—The Frog Book—Doubleday, Page & Co. | 4.00 |
| Marshall—The Frog—Macmillan | 1.10 |
| Osborn—Economic Zoology—Macmillan | 2.00 |
| Shipley & MacBride—Zoology—Macmillan | 2.60 |
| Metcalf—Organic Evolution—Macmillan | 2.50 |
| Maeterlinck—The Life of the Bee (might be in the general library of the school)—Dodd | 1.40 |
| Holland—Moth Book—Doubleday, Page & Co. | 4.00 |

## PHYSIOGRAPHY.

This course covers one year's work; one-half year in physical geography and one-half year in elementary geology. Unless the teacher has had an extended course in this branch and its cognate subjects the work is to follow rather closely the presentation given in some good modern textbook. The textbook work, however, is not to be followed to the exclusion of laboratory work, field work, and reference reading.

Laboratory Work.—Some such manual as Brigham's, published by Appleton & Co., or Darlin's, published by Atkinson, Mentzer & Company, is used. Note books are prepared with the same care that is used in other sciences.

Field Work.—This will comprise such topics as the following:

clouds and their movements, winds, etc., weathering of rocks, erosion, transportation and deposition; river currents and movements of water; rocks, minerals, folding, faults, stratification, evidences of movements of the crust, etc. Coal mines, quarries, etc., are visited.

Reference Reading.—Pupils are given reference readings in other textbooks. Government publications afford a considerable amount of collateral reading, especially those from the Geological Survey and the Department of Agriculture, Washington. The National Geographic Magazine, published by the National Geographic Society at Washington, is used.

## DOMESTIC ART AND DOMESTIC SCIENCE.

No attempt is here made to present a detailed course in either sewing or cooking. Only a few general suggestions are offered, and matters of detail are left to be worked out for each particular school by the superintendent and teacher.

The course in mind for which these suggestions are intended would cover four years. The time should be divided about equally; two years to sewing, two years to cooking. As many pupils do not remain in school longer than two years perhaps the best arrangement is to alternate the work, giving sewing in the first year and cooking in the second. For the third and fourth years the work may be presented in whatever order seems best.

The priciples of both sewing and cooking should be taught right along with the practical work. If a text-book is used, lessons may be assigned for home preparation; if not, the teacher must supply the lack by giving talks, or dictating notes, and these should be studied by the pupil and recited upon at another time. A clear understanding of the principles of sewing and cooking is necessary to maintain interest. To make all the work, or too much of it, practical will eventually destroy interest. The reasons why things are so, or why they must be done in a certain way, are the chief sources of interest and the basis for intellectual growth in this work.

From the very beginning attention should be given to forming habits of neatness, order, system, accuracy, cleanliness, pride in the work, etc. The educational value of all such work lies in acquiring a body of facts or priciples which are carried into practice at all times. Actions and conduct should be the outcome of knowledge, and habits should be the result of action directed by knowledge.

**Domestic Art.**

It is assumed that no work has been done in grades below the high school.

Beginning with lessons on the equipment necessary for each pupil, how to care for it and how to use each article, proceed with instruction in various kinds of stitches employed in different forms of sewing, then the different seams and when to use them. As soon as possible begin the making of some article for the pupil's use or for use in the home. A number of these have been suggested in the outline of "Domestic Art for Country and Village Schools." Begin with the making of simple articles and garments, proceeding gradually to those which are more complex. Give special attention to using proper stitching and seams for different work.

Theoretical instruction should go hand in hand with practical work. A study should be made of the different kinds of material used and the raw fiber from which they are made, as cotton, flax, wool and silk; the adaptation of different materials for certain uses; close and loose weave; kind of material best to be used for certain work; how to select cloth as to its lasting qualities, and as to design and color; washable and unwashable goods; clothing for winter and summer.

Selection of goods with regard to economy. Study cost of goods for various purposes; width of goods, color, durability, amount needed, cost for trimming, suitability to age; harmony of colors; harmony with other articles of clothing already possessed; cost of entire suit including dress, hat, gloves, and shoes; comparative cost of clothing ready made, made out of home, and made in the home; selection with reference to cost of laundering, pressing and cleaning.

Plan a dress and make up a complete statement of cost, including all items for cloth, trimmings and making. Add cost for hat, gloves and shoes to match.

Special attention should be given to the problem of dressing tastefully yet economically, and dressing with regard to health and comfort.

Call attention to the matter of caring for clothing so as to secure most service from it, and how to change and make over so as to be in accord with the current style in dress.

Laundering. The course should include a complete study of washing of different kinds of fabrics; the effect of hard and soft

water; how to break hard water; settling of muddy water; the use of soaps and washing powders; washing, rinsing, bluing, wringing, and starching; how to prevent colors from running; bleaching; drying; dampening and ironing.

Millinery. Selection of hat as to color, design and suitability to other items of dress; suitability to age; for dress and general wear. Cost of various types; cost of hat compared with other items of dress. How to make over; renovating material; making new hat.

**Domestic Science.**

After preliminary lessons on the purpose of the work, the arrangement of the kitchen and the care of the equipment, proceed to the study of the three different classes of foods, as carbohydrates, proteids and fats. What are the special nutritive elements in each of these groups; what is the nutritive value of each group, from what sources is each derived, and what proportion of each is necessary to maintain the human body in health and strength? Study effect of occupation on diet. Not enough attention has been given in most families to the "balanced ration" both as affecting health and as affecting the cost of living.

Plan the course so as to include the study of a number of types under each group, as, starches—rice, potatoes; sugars—candy, sauces; fats—butter, etc. These lessons can be prepared so as to proceed in an orderly development of the work. They will, of course constitute the greater part of the work.

Make intensive study of certain things, as milk. What are the chief constituents of milk? What is its food value? How does it compare with other articles as to food value? Butter; cheese and cottage cheese; condensed milk; bacteria in milk; how to care for it; how milk must be handled to keep it clean; cost of milk compared with other articles of food, and uses in cooking. (In this connection some account may be given of modern dairy methods and what percentage of butter fat should be had in good milk; what percentage of bacteria may be allowed and milk still regarded as good?)

Other studies of the same kind can be made as each different article of food is taken up. Each one should be studied as to its class as a food; its particular food value; compared with other articles of similar kind; how to care for it; methods of preparing it for use; different ways of cooking it; how, and with what, to

serve it; cost of meats, vegetables, eggs, fruits, fish, salads, beverages, desserts.

Emphasize the necessity of care in handling and caring for all articles of food so as to prevent contamination and souring, or decay. This should extend to the matter of handling all food supplies at the grocery. Emphasize the danger arising from foods improperly cared for. Discuss danger of decaying fruits, moulded bread and canned fruits; tainted meats. How to prepare canned goods so as to minimize danger.

Marketing. Pupils should be given a course in marketing. This should include vegetables and fruits in season; the amounts of each to buy for a family of so many persons; quantities to be bought at various seasons depending upon keeping qualities; comparative cost of smaller and larger quantities. How to buy meats; vegetables to go with certain meats; various kinds of meat as pork, beef, veal, mutton, poultry, and fish; fresh and dried or salt meats; canned meats and fish.

Study the methods of cutting meats and which are the best cuts; the cheaper cuts and how they may be used.

Study the various measures and weights used and have pupils look into the matter of ordinary food adulterations.

In a two years' course in cooking a course should be provided in the chemistry of food. This course should be worked out in connection with the regular classes in chemistry if it can be. At least it should be a laboratory course.

Menus. Write out menus for breakfasts, dinners, luncheons. Consider proper distribution as to food values and approximate cost of serving each menu to three or five persons. Plan meals for an entire day; for a week.

Table Service. Table linen; laying table for any certain number of persons; table decoration; placing host, hostess, and guests; arrangement of table ware; placing foods for serving; serving different courses; waiting table.

Home Nursing. How to detect common ailments particularly of children; common remedies which should be kept in the home for use; how to care for one confined to bed; bathing patient and changing bed clothing; dressing cuts, burns and bruises; caring for older people so as to secure comfort; preparing appetizing and nourishing food for the sick; care of utensils used in the sick room and disposal of all waste matter. Value of rest and quietness about

the sick room. When to send for the doctor and how to follow his instructions.

How to sterilize instruments and utensils used in the sick room, how to prepare antiseptic solutions, and how to disinfect the room. Much here suggested will be treated in the physiologies.

Household Accounts. Have pupils undertake to manage the household for one month, keeping accurate account of all expenditures. Have them apportion the month's income to rent, taxes, heat and light, clothing, groceries, meats, laundry and hired help, medical expenses, amusements, miscellaneous and savings. At the end of the month they should make a report as to their success in keeping expenses within the amount apportioned. The matter of keeping accurate accounts of household expenses will tend to show where extravagance prevails and where savings can be affected.

Apportioning the amount to be expended will also tend to show the necessity for carefully studying all items of purchase in order to secure the most and best for the amount which can be expended.

All the work in Domestic Science and Art should be in the hands of well-prepared teachers. It is a special work and to secure the best results should be taught by specialists.

The work must be carefully planned so as not to have too much repetition or overlapping, at the same time the work should be correlated wherever possible with the other work of the school.

While the character of the work should be very practical yet its aim should be to make home-makers rather than cooks, seamstresses or milliners. The work should embrace all the activities of the home.

Each school undertaking to give courses in domestic science should secure some reference books. Many very valuable monographs on fruits, vegetables, meats, etc., and how to prepare them may be secured from the Department of Agriculture, Washington, D. C. Write for a list of their publications and make such selection as may be needed.

## MANUAL TRAINING.

The local conditions will to some extent determine how much and what kind of manual training work should be undertaken in the high school. Whether or not manual training is given in the

grades below the high school, and, if so, the kind and amount of work done, must also be taken into consideration. The suggestions which are offered are general in their scope. Details of the course of study, of equipment, and of the character of the work to be attempted must be determined by the superintendent and his teacher.

1. In order to do good work there must be a clear concept of the thing to be produced. This is best developed by making a working drawing, and the ability to make the drawing implies a knowledge of the principles of mechanical drawing. Hence, courses in mechanical drawing should be begun at the very first and carried on coordinately with shop work.

2. Some time may of necessity be given to pure exercise work, but the amount should be limited, and the exercise should be one whose principle will be almost immediately applied to some piece of practical work. From the beginning the aim of the shop work should be to make some useful article. The preference of the pupil as to what he will make should be allowed, provided it is clear that his selection is not beyond his ability to construct.

3. Where but a limited amount of time can be given, the course should possibly be limited to work in wood. If work can be continued through the four years of high school, work in metals should form a part of the course. If it is impossible to secure room and equipment for metal work, forging, etc., this should be replaced by additional woodwork.

4. In all manual training work *quality* should be emphasized over quantity. Exactness, thoroughness, accuracy, good workmanship, and the recognition of the value of the corresponding habits, are the ends to be sought by the teacher in the work of every pupil, while the desire to do perfect work is the quality to be developed in the pupil. These qualities are moral as well as industrial, and have their re-actions upon character as well as upon workmanship.

5. In all the work the particular problem should be treated in relation to the corresponding general problems; that is, its relation to other school subjects shown, or its relation to the industries. For example, mechanical drawing will correlate with geometry. While pupils are doing bench and cabinet work they should make a study of the kinds and characteristics of the wood with which they are working. This will lead on the one side to botany, on the other to forestry, lumbering, wood manufactures, furniture, etc.

The following brief outline of work, or some adaptation of it will probably answer in most schools. It will be observed that it is

assumed that no manual work has been done in the grades below the high school.

**Outline of Course.**

First Year.—Bench work and cabinet making; wood turning; mechanical drawing.

Second Year.—Advanced cabinet making; pattern making and foundry practice; mechanical drawing.

Third Year.—Metal working; mechanical drawing.

Fourth Year.—Forging; machine shop practice to include work on the drill press, engine, lathe and milling machines; mechanical drawing.

Mechanical drawing is included in all years of the course. A course in drawing, independent of the practical work in the shop, might of course be given and would be valuable. But, in general, it will be found that better results are obtained by alternating and correlating it with shop work. The amount of time needed for drawing will vary, but a fair division will be about one-third drawing, and two-thirds shop practice.

A full course in drawing should include the following topics: Use and care of instruments; geometric constructions; working drawings; lettering; orthographic and isometric projections; developments, shading and right line shading; conic sections and intersections; machine details; architectural details; machine and architectural designs.

The following articles are suggested as suitable for bench work and cabinet making:

Sand paper block, knife sharpener, key rack, broom holder, necktie rack, towel rack, book shelf, medicine cabinet, bench hook, shoe blacking cabinet, taboret, candle stick, magazine rack, pedestal, picture frame, porch stand, library stand, library table, book case, piano bench, music cabinet, tool box, shirt waist box, rocking chair, porch swing, Morris chair, camp chair, umbrella stand, hall tree, clock, coat hanger, thermometer back, boxes for handkerchiefs, gloves, etc., ironing board, sleeve board, screens, kites. (For other models see list suggested under "Manual Training in Country and Village Schools.")

The metal work indicated for the third year is such as can be done without a large or costly equipment. It would include chipping and filing, fitting, bending, soldering, and hammering of copper, and brass. There are any number of exercises under each of

these operations, but selections should be made from some good textbook on the subject. The materials to be used are iron, steel, malleable iron, copper, brass, tin and wire.

The metal work for the fourth year is of such kind that but little can be said by way of description. It cannot be undertaken without extensive equipment and under the direction of an experienced instructor. It will include forging, molding, and casting, and all forms of machine work necessary to prepare the part of a machine for its particular use.

Instead of this year's work in metals, more advanced work may be done in cabinet making, pattern making, and metal working of the type suggested for third year.

## FREEHAND DRAWING.

One hour a week for the entire period of four years is required in this course. The following outline is merely suggestive.

1. Representation, (a) color, (b) mass, (c) line: Purpose,—(a) Better acquaintance with nature. (b) Conception of things as wholes. (c) Ability to see proportion.
2. Method.—(a) Silhouettes—landscape, figure, still life. (b) Two-tone drawings from cast. (c) Details from nature—trees, plants, still life, figure.
3. Media,—charcoal, water coloring wash, pencil.
4. Related to other subjects,—botany, study of plants.
5. Related to industry,—bookmaking, illustrations, textiles.

## CONSTRUCTIVE DESIGNING AND MECHANICAL DRAWING.

### One Year.

The work in designing and mechanical drawing should be continuous throughout the last two years of the high school course. Free hand drawing in the preceding years is a prerequisite. There should be three recitations per week, which should represent about five hours of work per week.

The drawings should be made on drawing paper 8 x 10, and properly fill the page with not more than two drawings on a page. The drawings may be in pencil, crayon, charcoal, pen and ink, or water colors. There should be free hand drawings guided by the eye and hand alone and instrumental drawings guided by mechanical means. The work should include:

I. Designing and ornamentation.

1. Purpose,—(a) Appreciation of beauty in spacing line, tone, and base. (b) Cultivation of sense of fitness with reference to material and use of object. (c) Skill in combining colors. (d) To give definite concepts and names for them. (e) To give experience in the use of pigments.

2. Method,—(a) Play with pure pigment. (b) Study of hue, value of intensity. (c) Color nomenclature. (d) Analysis of color.

3. Relation to other subjects.—Pottery—working designs; Woodworking—working designs; Metal working—working designs; Leatherworking; Physics,—spectrum.

4. Relation to industry,—(a) architecture, (b) furniture making, (c) use of metal, (d) leather, (e) tiling.

II. Constructive drawing, including lettering, geometrical constructions, projection lines, projection of plane surfaces, projection of regular solids, projection of regular solids turned at the various angles and truncated, intersection of regular solids, development of surfaces of regular solids and truncated solids, development of screw, thread, standard bolts and nuts, pulleys, etc.

## COMMERCIAL BRANCHES.

### General Suggestions.

It should never be forgotten that the aim of these courses is practical and useful. The public schools can and should turn out better bookkeepers and stenographers than those now coming from the private schools. If this is to be done, however, the instruction must be of a very high class,—always clear, definite, and exact. It should result in a ready and usable knowledge; and the immediate and useful phases of the subjects taught should never be sacrificed to the more remote phases, or those of less certain value. Bookkeeping should make a boy able to do the actual work of keeping books, and typewriting and stenography should make the students quick, careful and accurate in those arts.

### COMMERCIAL ARITHMETIC.

It should begin with a thorough review of notation and numeration, addition, subtraction, multiplication ,and division, in the first year.

Instruction in this subject is assigned to the first half of the

latter four of which extensive drills are to be given with a view to securing a high degree of accuracy and rapidity. Teach the addition of two columns at once. Give a careful review of fractions, in which the aim is not so much to secure the ability to manipulate long and complex fractions as it is to get a thorough understanding and a high proficiency in the matter of the use of simple ones. Cover the subjects of decimals, percentage and its applications, measurements, etc., very thoroughly, but with reference only to such forms and processes as are in actual use at present in modern business and commerce. In interest and other applications of percentage, wherever possible, have students draw up notes, drafts, checks, and other current forms, and base problems upon these. Problems relating to local industries and conditions are useful for the purpose of stimulating interest and making the work more valuable. Do not hesitate to minimize the amount of attention given to obsolete or unusual topics and forms, as for example, days of grace in interest transactions.

### COMMERCIAL GEOGRAPHY.

This subject is assigned to the second half of the first year. Vitality and interest should be given to instruction by connecting it as much as possible with the actual life of the community. Show where the coal, gas, oil, lumber, or other products of your vicinity find their markets, and what comes back in return. Study especially the trade routes by which these reach their markets, and the means of transportation in their relation to our state industries. In every possible instance give the work some local bearing or relation.

Secure the best modern texts for reference and class use. Much valuable material can be found in reports of the state and national governmental departments, the reports of various boards of trade, magazine articles, and similar sources. Pupils should do some supplementary reading under the direction of the instructor.

### TYPEWRITING.

The lessons in this subject should follow a very definite and carefully planned system, as given in text-books, or in the series of lessons prepared by some of the type-writer companies. The touch system, so-called, should be used. The two principal kinds of machines in common use are the double and single keyboards. Practice

should be given on both of these if possible. Most of the time should be given to the shift key machines as they are more largely in use than the others. The invisible machines have gone almost completely out of use and little time should be given them.

### First Year.

From the first use of the machine insist upon neat and accurate work. During this year discourage all attempts at speed, but let the whole attention be given to securing accuracy and good form. No pupil should be allowed to take a lesson in advance until the preceding lesson has been prepared absolutely without error and in perfect form. During this year the pupil should not be allowed to use, or even keep, an eraser, but should re-copy all lessons in which errors have been made. The teacher will find the system of grading issued by the U. S. Civil Service Commission in the pamphlet of Instructions to Stenographers quite useful.

### Second Year.

After the student has mastered the mechanical features of the work and gained a fair proficiency in the use of the machine in regard to neatness and good form he may take up special instruction and exercises along the following lines:

Duplicating and manifolding.

Erasures.

Tabulating and the making out of bills and other commercial forms.

Legal forms.

Programs, tables of contents, etc.

Specifications, testimony, etc., with covers and titles.

Forms too long for the carriage.

Addresses in various forms.

Letters and miscellaneous work of various kinds.

During this year some attention may be given to the matter of speed, but never at the sacrifice of accuracy or neatness. Letters from officials, business houses, etc., should be given the class or secured by its members for imitation or criticism.

Throughout the whole course each student should be required to attend to the matter of keeping the typewriter in good mechanical condition. Visiting agents will sometimes give informal lectures and demonstrations which will aid in this direction.

## BOOKKEEPING.

Any deficiency in the pupil's knowledge of the essential parts of arithmetic, or in his proficiency in its essential processes, that may become evident during this course should be remedied by appropriate reviews and drills. Some work in rapid calculating may well be made a regular part of the study. In the earlier part of the work errors should be ruled out with red ink and corrections interlined, instead of allowing erasures. Subsequently, off-setting and correcting entries should be used for this purpose. The legal status of the various books used should be taught, with the facts relating to the effect erasures or other faults might have in case the books were involved in some case at law. In cases where the instruction is largely individual and follows some of the so-called "budget systems" the teacher should give oral tests and quizzes frequently to test the work. In all transactions, in making out business forms, etc., the student should be required to use the same absolute honesty and accuracy that he will be expected to observe in actual business life.

### First Year.

The object of this year's work is to increase the pupil's knowledge of business forms, papers, and practices; to increase his proficiency in essential arithmetical calculations; and to instruct him in the science and the art of recording simple business transactions in approved forms, and to prepare the statements or balance sheets that show the results of these things.

Calculations. As much drill as seems necessary upon the elementary processes of addition, subtraction, etc., practical measurements; fractions; the various kinds of discounts; interest; commission; partnership; etc. The pupil by this time should understand the principles involved in these topics, and the drills given should be towards securing rapidity and accuracy in his calculations.

Business Forms. Practice designed to secure complete familiarity with such forms as notes, bills, statements, account sales, telegrams, receipts, due-bills and credit memoranda, checks, endorsements, etc. Students should be able to write many of these upon blank paper.

Account-keeping. Practice in opening and closing simple sets of transactions in both single and double entry, in changing from one system to the other, with an undertsanding of the chief differences between the two systems. The pupil should be intimately ac-

quainted with the forms and uses of the following books, and should be able to make the standard rulings for them on blank paper:

Journal-daybook.
Cash book.
Sales book.
Invoice book.
Ledger.
Balance sheet book.
Bank pass book.
Notes book.
Check book.

Students should be able to make off trial balances, statements of resources and liabilities, of losses and gains, etc.

### Second Year.

In larger high schools, with more specialized courses, a second year's work in this branch might continue the work of the previous year as follows:

A somewhat higher degree of technical knowledge and skill will be acquired and some specialized forms of bookkeeping may be advantageously studied, such as those kinds of business requiring peculiar systems of ruling in the books used. Some of these might be as follows: Commission business, requiring sales and cash book with extra columns, consignment ledger, shipment ledger, main ledger, etc. Some attention may be given to loose leaf ledgers, card ledgers, etc. Later in the year if time be available some instruction may be given in corporation and bank accounting.

## STENOGRAPHY.

### First Year.

Too much stress can not be laid on correctness and uniformity. No attempt should be made at first to secure speed. If classes are large, use may be made of the blackboard to advantage, and notes of pupils should be uniform enough to allow exchanges of papers to be made among pupils for purposes of study, criticism, and correction. From the first the proper amount of dictation should be given. Continual and constant review and drill should be given. Sight reading and other devices should be used to arouse and maintain interest. It is not advisable to correlate work in typewriting and stenography during the first year. Constant reference to the printed form of symbols should be made, as by trusting to memory incorrect forms may get fixed in the mind.

**Second Year.**

In schools with sufficient equipment and means for elaborate and highly specialized courses a second year's work may be given. Begin with a careful review of the manual. Then begin a carefully graded reader in the system used. Base work upon this, for copying, blackboard work, etc. After the completion of the work in the reader a carefully edited dictation text may be taken up. Attention may gradually be given to the matter of speed, and by the end of the year an average of a hundred words a minute on matter of moderate difficulty may be expected.

## COMMERCIAL LAW.

A term in this subject is offered during the last year. Some good elementary text-book should be followed, and attention in general should be concentrated in a definite way upon the practical and useful aspects of the subject. Lectures of a rather informal sort by representative attorneys of the community may often be secured and will add to the value and interest of the work.

## AGRICULTURAL COURSE FOR RURAL HIGH SCHOOLS.

Many of the new high schools now being established in West Virginia are rural, and the chief function of such schools should be to meet the needs of the community.

The following outline is suggested in connection with the text. The material is arranged for a four year course. If the school offers but one, two, or three years' work in the subject, the teacher may select such material from the outline as will be best suited to the pupils and the particular needs of the commuinty.

| *First Semester.* | *Second Semester.* |
|---|---|
| **First Year.** | |
| English (5) | English (5) |
| Algebra (5) | Algebra (5) |
| Biology—Zoology (5) | Biology—Botany (5) |
| Domestic Animals and Their Products (5) | Forest, Orchard and Garden (5) |
| Music and Drawing — Elective (2) | Music and Drawing — Elective (2) |
| Shop work or Domestic Science Elective (3) | Shop Work or Domestic Science Elective (3) |

**Second Year.**

| | |
|---|---|
| English (5) | English (5) |
| Geometry (5) | Geometry (5) |
| Foreign Language (5) | Foreign Language (5) |
| Agronomy—Farm Crops (5) | Agronomy—Soil Elements and Crop Production (5) |
| Music and Drawing—Elect. (2) | Music and Drawing—Elect. (2) |
| Shop Work or Domestic Science Elective (3) | Shop Work or Domestic Science Elective (3) |

**Third Year.**

| | |
|---|---|
| English (3) | English (3) |
| Farm Mechanics (2) | Farm Management (2) |
| Foreign Language (5) | Foreign Language (5) |
| Physics (5) | Physics (5) |
| English History (5) | English History (5) |
| Shop Work or Domestic Science Elective (2) | Shop Work or Domestic Science Elective (2) |

**Fourth Year.**

| | |
|---|---|
| English (2) | English (2) |
| Special Agriculture—Elect. (3) | Plant and Animal Improvement (3) |
| U. S. History (3) | U. S. History (3) |
| Civics (2) | Civics—Country Life Movement (2) |
| Chemistry (5) | Chemistry (5) |
| Com. Arith. and Bk. (5) | Com. Arith. and Bk. (5) |
| Shop Work or Domestic Science Elective (2) | Shop Work or Domestic Science Elective (2) |

**First Year—First Semester.**

*Domestic Animals and Their Products.*

I. HORSES.

1. Types and breeds of horses.
2. The anatomy of horses, studies from chart or skeleton.
3. Practice in judging horses.
4. Points in good horsemanship.
5. Care of horses.
6. Feeding and watering horses.
7. Common diseases of farm horses, and what to do.

II. CATTLE.

1. Types and breeds of cattle.
2. Practice in judging cattle.
3. Identification of common breeds.
4. Some cattle diseases, and how to treat.

III. SHEEP.

1. Coarse and fine wool sheep contrasted both for mutton and wool.
2. Care of sheep.
3. Judging sheep.

IV. HOGS.

1. Market types of hogs.
2. Identification of breeds.
3. Practice in judging hogs.

V. POULTRY.

1. The common breeds of chickens.
2. Points of excellence in breeds .
3. Care of poultry.
4. Construction of poultry houses.
5. Use of the incubator and the production of spring chickens.

VI. ANIMAL PRODUCTS.

(May be studied with the animal producing.)

1. Milk, composition; use of Babcock tester; care in handling; butter and cheese.
2. Beef, production; different cuts of meat; cost and comparative values.
3. Wool; coarse and fine.
4. Eggs; feeding to produce.

VII. FEEDS AND FEEDING.

1. Function and need of food.
2. Balanced rations and nutritive ratio, for various animals.
3. Silage and its use.
4. Carbo-hydrate, protein, and roughage foods.

REFERENCES.

Types and Breeds of Farm Animals—Plum—Ginn & Co., New York ..... $2.00

Studies of Farm Animals—Davenport—Ginn & Co., New York ..... 2.50
Elements of Agriculture—Warren—Macmillan Co., New York ..... 1.10
Breeders Gazette—Chicago—Per year ..... 2.00
Feeds and Feeding—Henry—Orange, Judd Co., New York ..... 2.00
Diseases of Farm Animals—Laws—Orange, Judd Co., New York ..... 3.00
Milk and Its Products—Wing—Orange, Judd Co., New York ..... 1.50

**First Year—Second Semester.**

*Elements of Forestry (Six Weeks.)*

I. Necessity for forest conservation. Influence of forests on soils and stream flow, and water supply. The wood-lot, a farm crop, whose resources are to be managed wisely

II. PRINCIPLES OF GENERAL FORESTRY.
1. Life history of trees, with studies of structure, nutrition, and growth.
2. Influences which affect tree growth, such as temperature, moisture, soils, light, other trees, etc.
3. Studies of principal tree species of the community, *silvical* qualities.
4. The forest as a tree society, and the struggle for existence. with effects upon development of trees.
5. Enemies of forests, fire, insects, diseases and bad lumbering.
6. Influence of forest on climates, water supply, stream flow, and soil.

III. THE FARM WOOD-LOT.
1. Relation of wood-lot to the farm; origin, condition and extent of wood-lots; trees as farm crops.
2. Methods of measuring the wood crop, both as standing timber and in logs. Field trips for actual practice.
3. Wood-lot management; how and when to cut trees; what trees to cut and what to leave; methods of improving the wood-lot; marketing lumber; planting trees; and protecting the wood crop from enemies.

4. Practical studies of given wood-lots:
   (a) Species predominating.
   (b) Age.
   (c) Density.
   (d) Condition of stand.
   (e) Reproduction.
   (f) Protection given.
   (g) Maturity and market facilities—estimated stand of mature timber.
   (h) Advice to owner, as to improvements needed.

   Trips should be made to a forest to study these points first hand.

REFERENCES.

First Book of Forestry—Roth—Ginn & Co., New York.. .75
A Course in Elementary Forestry—Forest Service, Washington, D. C.
The Land We Live In—Small, Maynard & Co., Boston, Mass. ..... 1.50

*The Orchard and Garden.*

I. LOCATING AND LAYING OUT THE ORCHARD.
   1. Preparation of the ground.
   2. Selecting the nursery stock.

II. PLANTING THE ORCHARD.
   1. Preparation of the trees for planting.
   2. Setting the trees.
   3. Care of the transplanted trees.

III. PRUNING.
   1. Principles of pruning.
   2. Pruning young and old trees.
   3. Pruning fruit and ornamental trees.

IV. GRAFTING.
   1. Top grafting of apple trees.
   2. Root and crown grafting.
   3. Various methods of grafting and budding.

V. SPRAYING.
   1. Common fungous and insect enemies of tree and fruit.
   2. Spraying materials.

3. Making spray mixtures.
4. Spraying for codling moth and other insects and diseases.
5. Practical demonstrations of spraying.

VI. PICKING, STORING AND MARKETING FRUIT.

VII. THE GARDEN.

1. Laying out and planting home gardens.
2. Preparation of garden land.
3. Planting home and school gardens.
4. Transplanting and thinning.
5. Forcing garden vegetables.
6. Fertilization of flowers.
7. Small fruits in the garden.
8. Cultural requirements of the leading vegetables.
9. Growing ornamental plants.
10. Beautifying home and school grounds.

REFERENCES.

Principles of Fruit Growing—Bailey—Macmillan & Co., New York ..... $1.25
Orcharding on Rough Land—Moore—S. W. Moore, Gallipolis Ferry, W. Va..... 1.50
The Nursery Book—Bailey—Orange-Judd Co., Chicago 1.25
Manual of Gardening—Bailey—Macmillan & Co., New York ..... 1.25

**Second Year—First Semester.**

*Agronomy. Farm Crops.*

I. GRAINS.

1. Wheat. Description of varieties; grading; market standards; the proper seedbed for wheat; testing varieties in experimental plots.
2. Same for oats.
3. Corn. Description of varieties; judging and use of seed corn. Selecting and storing seed corn.
4. Botanical relations of the grain crops.
5. Insects and fungous diseases of the staple grain crops.

II. LEGUMES.

1. Identify and describe as many of the following as are available: Alfalfa, red clover, alsike clover, cow peas, soy beans, vetch and field peas.

2. Effects of legumes on soil fertility.
3. Value as food for farm animals.
4. Botanical relations of legumes.

III. GRASSES.

1. Identify and describe the following grasses: Timothy, blue-grass, orchard grass, red top, millet, sorghum, rye and wheat.
2. Uses of grasses for grain, hay and pastures.
3. Botanical studies of grasses.

IV. WEEDS.

1. Identify twenty-five common weeds. Collect samples of weed seeds.
2. Judge clover and alfalfa seeds for purity.
3. Make germination tests of weed seeds.
4. Describe common weeds as to stem, leaf, seed, flower, root and habit of growth.
5. Methods of eradicating different weeds.

V. HARVESTING FARM CROPS.

1. Make tables of actual neighborhood yields of the standard farm crops.
2. Make tables of prices of farm crops for the past five years.
3. Reports upon methods of harvesting farm crops.

REFERENCES.

| | |
|---|---|
| The Cereals of America—Hunt—Orange, Judd Co., Chicago | $1.75 |
| The Book of Corn—Myrick—Orange, Judd Co., Chicago | 1.50 |
| Grasses, Clovers and Forage Plants—Shaw—Orange, Judd Co., Chicago, (three books) each | 1.00 |
| Alfalfa—Coburn—Orange, Judd Co., Chicago | .50 |

**Second Year—Second Semester.**

*Agronomy. Soil Elements and Crop Production.*

I. SOIL PHYSICS.

1. Formation and classification of soils. Collect samples of soils.
2. Experiments to study the water relations of soil—capillarity, drainage, soil mulch, filtration, etc.

3. Effects of lime on soils.
4. Influences affecting temperature of soils. Effects of freezing.
5. Tillage and its influence on conditions for germination and growth of plants.

II. SOIL FERTILITY.

1. Elements of fertility in soil.
2. Commercial fertilizers and farm-yard manures.
3. Experiments with plots of ground, using no treatment, all possible combinations of the commercial fertilizers and manures, upon others to note the effect upon the crops used in rotation on the plots from year to year.
4. Humus and its importance in the soil.
5. The relation of tillage to soil fertility.
6. Crop rotation and soil fertility.
7. Critical study of the yields and farm practices of the community.
8. The National Soil Fertility League.

III. CROP PRODUCTION.

1. Planting. Thick and thin seeding of oats or corn. Methods of planting potatoes. Preparation of seed beds.
2. Cultivation. Purposes of cultivation. Methods of cultivation. Shallow and deep cultivation. The soil mulch. Excursions to fields to note effects of various methods.
3. Growth of plants. Study of the root systems of corn and other field crops. Rate of growth of corn. Factors influencing plant growth. Insects and fungus diseases injuring growth.

REFERENCES.

The Soil—King—Orange, Judd Co., Chicago ..... $1.50
Soil Fertility and Permanent Agriculture—Hopkins—Ginn & Co., New York ..... 2.00
How Crops Feed—Johnson—Orange, Judd Co., Chicago ..... 1.50
The Fertility of the Land—Roberts—Orange, Judd Co., Chicago ..... 1.50
Farmers' Bulletins Nos. 35, 91, 129, 132, 229 and 249, U. S. Department of Agriculture, Washington, D .C.

**Third Year—First or Second Semester.**

*Farm Management.*

I. FARM ACCOUNTS.
1. Farm book-keeping.
2. Cost of keeping farm animals.
3. Crop records.
4. Insurance, taxes, etc.

II. THE FARMSTEAD.
1. Arrangement of fields, and location of buildings.
2. Proportion of animal, machine, and building equipments to size of the farm.
3. Each student should design a farmstead—the fields, drives, buildings, equipment, etc.

III. SYSTEMS OF CROPPING AND OF LIVE STOCK HUSBANDRY.
1. Systems of crop rotation.
2. Live stock farming.
3. Fruit farming.
4. General farming.

*Farm Machinery.*

I GENERAL CARE OF FARM MACHINERY.

II. DETAIL STUDY OF THE PLOW.
1. Taking down and setting up of a plow, or other implement.
2. Adjustment of plow for deep or shallow plowing and for wide or narrow furrow.

III. THE GASOLINE ENGINE.

IV. CONCRETE CONSTRUCTION.

V. DRAINAGE. VARIOUS SYSTEMS.

VI. REPORTS ON SPECIAL SUBJECTS.

REFERENCES.

Farm Dwellings—Wing.

The Farmstead—Roberts—Orange, Judd Co. ..... $.50

Country Life in America—Periodical.
Farm Machinery and Motors—Davidson and Chase—Orange, Judd Co. ..... 2.00
Concrete Construction about the Farm—Portland Cement Co.
Farm Drainage—Elliot—Orange, Judd Co. ..... 1.00
Sanitation of Country Houses—Bashore—Wiley & Co., New York ..... 1.00

**Fourth Year—First Semester—Elective Agriculture.**

*Plants and Animal Improvement.*

I. ORIGIN AND HISTORY OF DOMESTIC ANIMALS.

II. NATURAL SELECTION AMONG ANIMALS.
1. Improvement by selection.
2. Heredity.

III. PRINCIPLES OF BREEDING.
1. In-breeding and cross-breeding.
2. Cross fertilization of corn, artificial and natural.
3. Selection as a method of improving grain.
4. Freaks among plants and animals.
5. Fixing desired characteristics.

REFERENCES.
Animals and Plants—Davenport—Ginn & Co..... $1.25
Elements of Agriculture—Warren—Macmillan & Co... 1.10

**Country Life Movement.**

(*In connection with Civics in Second Semester.*)

I. COUNTRY LIFE INSTITUTIONS.
1. School.
2. Church.
3. Grange.
4. Home.

II. MODERN IMPROVEMENTS AND CONVENIENCES IN COUNTRY LIFE.
1. Roads.
2. Rural mail.

3. Telephone.
4. Automobile.
5. Running water in the house.

III. AGRICULTURAL EDUCATION.
1. Farmers' need of education.
2. Agriculture in public schools.
3. Agricultural extension work of the colleges.

REFERENCES.

Chapters on Rural Progress—Butterfield, University of Chicago Press, Chicago ..... $1.00
Report of Country Life Commission
The Country Life Movement—Bailey—Macmillan Co., New York ..... 1.25

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## EXCERPTS FROM THE SCHOOL LAW.

Sec. 79. It shall be the duty of the state superintendent of free schools to prepare and distribute a manual containing the courses of study prescribed by the committee on course of study and such other matter as may seem necessary to enable teachers to carry out the said courses of study, and his further duty to see that the teachers in all the various schools follow the course of study so prescribed; he shall also provide for the examination and graduation of pupils who satisfactorily complete the said course of study, and shall issue diplomas thereto.

Sec. 131. The state board of education shall perform the duties heretofore performed by the state board of examiners as herein provided, and in addition thereto, they shall constitute a committee on course of study and as such committee, shall prescribe a course of study for the public schools of the state, including the district schools, and define the relations that each shall bear to the others.

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